BUREAU OF HYGIENE AND TROPICAL DISEASES.

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YELLOW FEVER.

i. JAMES (S. P.). Renseignements sur la fièvre jaune reçus au cours des six mois finissant le 30 septembre 1935. [**Information on Yellow Fever received during the Course of the Six Months ending 30th September, 1935.**]—*Bull. Office Internat. d'Hyg. Publique.* 1935. Dec. Vol. 27. No. 12. pp. 2354–2357.

ii. SOREL. Le diagnostic histologique rétrospectif de la fièvre jaune dans les colonies françaises. [**A Retrospective Histological Diagnosis of Yellow Fever in French Colonies.**]—*Ibid.* pp. 2358–2359.

iii. BABLET (J.). Note préliminaire sur le diagnostic histologique de la fièvre jaune. [**A Preliminary Note on the Histological Diagnosis of Yellow Fever.**]—*Ibid.* pp. 2360–2364. With 2 coloured plates.

iv. LLOYD (Wray). L'emploi d'un virus cultivé associé à l'immunsérum dans la vaccination contre la fièvre jaune. [**The Use of Culture Virus together with Immune Serum in Vaccination against Yellow Fever.**]—*Ibid.* pp. 2365–2368.

v. BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1935. Dec. Vol. 27. No. 12. pp. 2369–2370.—Rapport de la commission de la fièvre jaune. [**Report of the Yellow Fever Commission.**]

i. During the course of 1935 up to the end of September, cases of yellow fever have been recorded from Bolivia, Brazil and Colombia, in South America; and from the French Congo, Dahomey, Ivory Coast, Niger Territory, Togo, Gambia, Gold Coast, and Sierra Leone, in Equatorial Africa. In South America, especially Brazil, there have been epidemics with many deaths, but in Africa only sporadic cases have been reported.

With reference to the specificity of the mouse protection test FINDLAY has tested the serum from a case of "Congolese Red Fever" [see this *Bulletin*, 1935, Vol. 32, p. 881] and found that it contained no yellow fever antibodies.

The Bathurst epidemic in 1934, although apparently almost entirely limited to Europeans, was accompanied by a general increase in the mortality amongst the native population, and out of 36 young men resident in the town, the blood of 16 protected against yellow fever.

In the interior of the Colony protection tests have given the following results :—

Localities	Number of persons examined	Number of protection tests positive	Age Groups among which occurred the positive tests
Basse (Upper River Province)	53	10	9–40 years
Georgetown (McCarthy Island)	49	14	4–40 ,,
Kerewan (North Bank Province)	38	12	4–40 ,,
Bakau (South Bank Province)	45	13	4–40 ,,
Brikama (Kombo) ...	44	13	4–40 ,,

Evidence is also presented showing that in Gambia, as in Brazil, there are two types of yellow fever, one urban, and the other rural, the latter occurring in isolated districts where *Aëdes aegypti* has not been found and the problem of whether man is the only reservoir of infection is very uncertain. The examination of monkeys and domestic animals near Bathurst has given negative results, but in the forest region of Ashanti on the Gold Coast, the blood of a *Colobus* monkey protected against yellow fever, as well as that of one child out of 12 examined. In London 565 persons have now been vaccinated by means of virus and immune serum, and preference is given to the use of human immune serum in place of any heterologous serum. The neurotropic virus has been generally used, but in 21 persons cultivated virus has given equally satisfactory results, and recently Dr. FINDLAY has used an attenuated viscerotropic strain supplied by Wray LLOYD [see below].

ii. Up to October 1st, 1935, 34 specimens of liver from Europeans who had died after febrile periods of less than 10 days had been received from various French Colonies and examined at the Institut Pasteur by Dr. BABLET. Histological evidence of yellow fever was found in specimens from Niger Territory, Ivory Coast, Dahomey and Togo, also from Brazzaville and Pointe Noire, in French Equatorial Africa.

iii. Specimens not larger than 1 cm. cube are fixed in 15 per cent. formalin for 8 days and then transferred to 5 per cent. formalin for transport. Frozen sections of such material can be stained with Scharlach R or Sudan III, and at once show any sign of fatty degeneration. Paraffin sections are stained either with Mallory's phosphotungstic haematoxylin, or Masson's trichromic stain [Haemalum, Eosin and Saffron].

The characteristic features are found to be : (1) fatty degeneration of varying intensity accompanied by extensive necrosis of the cellular regions ; (2) a diffuse leucocytic infiltration, concentrated in perivascular masses in the portal cavities ; (3) the bile ducts and great vessels are unaffected. In addition the author gives a useful discussion of the main features distinguishing yellow fever from other pathological conditions.

iv. The author records experiments, in conjunction with THEILER and RICOT, in which a viscerotropic strain has been maintained in

tissue culture, containing pieces of mouse embryo, for 130 passages during a period of 21 months. Before culturing, this strain was invariably fatal to monkeys, but during the course of this period it has gradually lost its virulence and from the 45th to 109th passage 17 monkeys inoculated with this culture virus have all survived. On the other hand, its neurotropic properties, as tested by intracerebral inoculations into mice, do not seem to have altered. This attenuated virus was passaged through a series of 20 *rhesus* monkeys and the 5th, 6th and 20th animals died of yellow fever, the others showing at the most a slight febrile reaction. From the 20th to the 28th passage, however, there was a definite return to the original virulence.

Twenty persons have been successfully immunized by the injection of known quantities of this cultivated virus together with quantities of human immune serum ranging from 0·5 cc. to 0·6 cc. per kilo body weight. Only three had any fever (37·7°C.) ; four others showed a slight rise in temperature of half a degree or less, and the remaining 13 no reaction whatever. The blood of five of these subjects was tested 14 to 28 days after vaccination and all showed the presence of yellow fever antibodies in titres ranging from 1/8 to 1/128.

v. After referring to some of the investigations mentioned above, the Commission recommends the adoption of certain measures to prevent the possibility of the infection being carried by aircraft, and the transformation of existing aerodromes not only in Africa but also at Karachi, India, into anti-yellow fever aerodromes. *E. Hindle.*

SAWYER (W. A.) & WHITMAN (Loring). **The Yellow Fever Immunity Survey of North, East and South Africa.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Jan. 25. Vol. 29. No. 4. pp. 397–412. With 2 maps. [12 refs.]

This valuable paper completes the general survey of the continent, started early in 1931 by the International Health Division of the Rockefeller Foundation with the co-operation of the governments concerned, and in addition contains a brief summary of the results obtained in previous reports.

It is only possible to give the main conclusions of this paper and for details the original should be consulted. It is shown that in Africa, yellow fever in man, as determined by blood tests in mice, is widely but irregularly distributed in a region extending from the coast of Senegal eastward for approximately 3,300 miles to the upper reaches of the White Nile in the Anglo-Egyptian Sudan. On the north this region is limited by the Sahara Desert. On the west and south the boundary follows the coast of the Atlantic Ocean from Senegal to the extreme north of Angola, then eastward across Angola and the southern part of the Belgian Congo. The region has a maximum width of about 1,400 miles and lies between latitudes 16°N. and 6°S.

A few isolated blood specimens with protective serum obtained from individuals outside this region are explained as probably being due (1) to infection as a result of visiting some distant place, (2) to sporadic infection with virus introduced into the locality, or persisting there under conditions unfavourable to the spread of the infection, or (3) to an exceptional concentration of some non-specific factor in the blood.

Within the region of immunity there were areas in which no immunes were discovered, others in which only a small proportion of the adults

were immune, and still others in which considerable proportions of both adults and children had protective serum. But the whole region must be regarded as endemic, as the disease is always present and widely distributed.

The western area, extending to the eastern border of Nigeria and including the coastal region from Nigeria to Angola, has had numerous epidemics of yellow fever and is still having them. All the historic outbreaks have occurred there, except the two introductions of yellow fever into Morocco in 1804 and 1881, and the yellow fever in coastal towns of Angola up to 1889. In West Africa, the existence of frequent urban and town epidemics in which *Aëdes aegypti* is undoubtedly the vector, would make it almost impossible to recognize any method of transmission or persistence, other than the common one previously established. In the eastern area, including the remainder of the region of immunity, the situation is radically different, for yellow fever has never been recognized except for a single *probable* case recorded by HEWER in the Anglo-Egyptian Sudan [see this *Bulletin*, 1934, Vol. 31, p. 833]. Europeans stationed in places where a large proportion of the natives are immune have never been known to contract the disease, and the heavily immunized areas would seem to be continuously endemic rather than epidemic. It is possible, however, that the immunizing infection may be with strains of lowered virulence, or a selective virulence, or a different set of tissues. This is suggested by the extensive alterations occurring in the laboratory, and by minor differences in virulence between virus strains from different sources.

Within this eastern area there is an ill-defined zone between latitudes 3°N. and 8°N. giving a high prevalence of immunity among children and adults. There is a diminishing incidence of immunity to the north and south of this zone.

The environmental conditions which favour yellow fever immunization are largely unknown. They may be similar to those responsible in the case of jungle yellow fever in South America, or may be peculiar to Africa. The existence of this zone of high prevalence would seem to offer an excellent opportunity for an intensive study by epidemiologists, pathologists, bacteriologists, entomologists and zoologists to determine (1) the symptomatology and pathology of the disease produced by the immunizing infection, (2) the characteristics of the prevailing strain of yellow fever virus, (3) the identities and habits of the blood-sucking arthropod vectors, and (4) the presence or absence of warm-blooded animal hosts other than man. Studies along these lines should make it possible to estimate the extent of the danger from yellow fever in Central Africa and the probability of its spread to the eastern coast, and should also help to determine the most suitable precautionary measures.

E. H.

VAN DEN BERGHE (Louis). L'immunité amarile de sérums prélevés chez des ictériques en Uélé (Congo Belge). [**Yellow Fever Immunity in Sera from Cases of Jaundice in Uélé (Welle), Belgian Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1935. Dec. 31. Vol. 15. No. 4. pp. 561–566.

A discussion of the problem of yellow fever immunity in the Belgian Congo, together with the results of the examination of serum from 62 inhabitants of the Uélé (Welle) District.

The author draws attention to the curious fact that in many districts of the Belgian Congo where yellow fever has never been recognized clinically, the results of protection tests indicate a higher percentage of infection than in many coastal districts where epidemics have occurred.

The existence of fairly numerous cases of febrile jaundice in the Ubangi and Uélé Provinces suggested the possibility of there being yellow fever, but serological examinations of these cases showed no higher percentage giving positive protection tests than in the surrounding population. Tests for spirochaetal jaundice were negative and therefore one must assume the existence of epidemics of another type of febrile jaundice. The cases closely resemble those recently described in Nigeria by BEEUWKES, WALCOTT and KUMM [see this *Bulletin,* 1931, Vol. 28, p. 858] and also in Colombia by BAUER and KERR,* as well as in various European countries. The aetiology of this disease at present is unknown. *E. H.*

NIGERIA, COLONY AND PROTECTORATE OF: REPORT ON THE MEDICAL AND HEALTH SERVICES FOR YEAR 1934. [**Yellow Fever** p. 16.]

The Annual Report of the Medical Department of Nigeria contains a brief account of a small outbreak of yellow fever in the Northern Provinces. In November–December 1934 there was a large influx of persons from the northern borders into Katsina and Kano Provinces. Existence of the disease was known at Zinder and elsewhere to the north during the preceding three months, and it is possible, or even probable, that infection was thus imported. No cases were reported in the Southern Provinces, suspected cases, one at Mamfe, and one at Ife, not being confirmed. Three Europeans were infected; the first on November 21st, an administrative officer who had been touring the Gaya district 40 miles east of Kano; on the 27th of the same month, a Frenchman residing at Ringim 44 miles from Kano (this patient died); on 1st December a resident of Kano.

Immediate steps were taken. The township and Government Station of Nasarawa were declared an infected area. A mosquito survey was made and huts in the neutral zone where breeding of *Aëdes* was prevalent were demolished, and a careful scrutiny of African fever cases undertaken and 6 suspicious cases were reported. By the protection test 3 were negative, 1 doubtful and 2 positive. This is, of course, not conclusive evidence that any of them were really cases of the disease. The reduction in mosquitoes was greatly assisted by a severe harmattan during the period in question and this, doubtless, played a part in limiting the outbreak. *H. H. S.*

GAMBIA, COLONY OF THE: ANNUAL MEDICAL AND SANITARY REPORT FOR THE YEAR 1934 [BERMINGHAM (H. J.), Acting Senior Medical Officer]. [**Yellow Fever** pp. 55–57. Appendix I.]

Dr. H. J. BERMINGHAM, Acting Senior Medical Officer, recorded the reappearance of yellow fever in the Colony during the last quarter of 1934. There were 5 cases in all, two in October, one in November and two in December, 4 Europeans, 1 African, all fatal. The measures adopted on discovery of the first case were: More active antimosquito measures; evacuation and fumigation of the house where a case

* *Bol. Oficina Sanitaria Panamericana.* 1933. July. Vol. 12. No. 7. pp. 696–715.

occurred and those in the immediate neighbourhood ; examination of Europeans in the vicinity (they were subsequently moved to more healthy areas) ; issue of warning notices to the public regarding precautions against mosquito-borne diseases ; enforcement of quarantine. Bathurst was declared an " infected place " in November. Dr. J. A. A. DUNCAN, Assistant Director of the Health Service, Sierra Leone, was called in to assist and an intensive sanitary campaign was inaugurated. House-to-house inspection was undertaken, the town was cleansed, eaves and gutters were removed, wells on Government property closed, four bush type incinerators erected, sumps and soakage pits to standpipes, and ditches and drains holding water were oiled, long grass was cut and burnt, lighters, barges and boats along the foreshore were inspected, unprotected water tanks were oiled, in short an attempt was made to remove all conditions favouring mosquito breeding. Towards the end of December all European officials moved to Cape St. Mary and non-officials were recommended to do the same. None was allowed to return to Bathurst to reside unless protected by inoculation. The sanitation of Bathurst is below a satisfactory standard even after the extra and more intensive efforts. The problem is largely one of drainage and presents considerable difficulties. *H. H. S.*

BIRAUD (Yves). **Present-Day Problems of Yellow-Fever Epidemiology.** —*League of Nations Epidemiol. Rep.* 1935. July–Sept. Vol. 14. No. 7–9. pp. 103–173. With 10 maps. [10 pages of refs.] [In parallel French & English.]

An excellent general account of the subject with a series of maps illustrating the distribution of yellow fever and its vectors, and also the results of protection tests and viscerotomy. The author deals especially with the present world distribution of yellow fever ; its reservoirs and vectors ; the natural and artificial possibilities of its spreading and methods of preventing any such spread ; and, finally, the methods of control and eventual eradication of infection from areas where it persists in an endemic or endemo-sporadic form.

Although the article contains nothing original it is a useful summary of recent advances in our knowledge of the epidemiology of yellow fever. *E. H.*

BONNE (C.). Over de afwezigheid van immuniseerende stoffen tegenover gele koorts virus in het bloed van bewoners van Java. [**Absence of Yellow Fever Antibody in the Blood of Javans.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1935. Dec. 24. Vol. 75. No. 26. p. 2183.

The sera of 39 natives of Java and of 10 Chinese were tested for their protective character against neurotropic yellow fever virus in mice. Usually 6 mice were used for each serum. It was found that with native sera one mouse remained alive after test six times and in one instance two mice. With sera of the Chinese, one mouse remained alive three times. These survivals in the experiments have no significance in the interpretation of the results and the conclusion drawn is that yellow fever immune body was not present in the sera tested.

W. F. Harvey.

FINDLAY (G. M.), STEFANOPOULO (G. J.), DAVEY (T. H.) & MAHAFFY (A. F.). **Yellow Fever Immune Bodies in the Blood of African Animals. Preliminary Observations.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Jan. 25. Vol. 29. No. 4. pp. 419–424. [11 refs.]

A record of the results of the examination of the blood of 25 apes and monkeys, and 25 other kinds of mammals and birds, from Africa, in order to determine the presence of yellow fever immune bodies.

The primates examined were obtained in 1934 from the Gold Coast and French Guinea, and in 1935 from Bathurst, Gambia and the Belgian Congo, and comprised 6 chimpanzees and 19 other monkeys. Seventeen Asiatic monkeys were used as controls and all were negative. Of the African monkeys, three were positive, a chimpanzee from French Guinea, a baboon from the Belgian Congo, and a *Colobus* monkey from the Gold Coast. Human sera protecting against yellow fever have been obtained from the same areas.

The bloods of a number of wild and domestic animals and birds were all negative except those of two sheep from the Gambia, one of which protected in a dilution of 1 in 64, the other to 1 in 8. One of six English sheep used as a control also protected in a dilution of 1 in 2, though not when 1 in 4.

These results suggest that in rural as opposed to urban areas, monkeys may play some part in maintaining the continued existence of yellow fever. *E. H.*

LAIGRET (J.). La vaccination préventive contre la fièvre jaune. [**Preventive Vaccination against Yellow Fever.**]—*Rev. d'Immunologie:* Paris. 1935. Mar. Vol. 1. No. 2. pp. 113–133.

A useful summary giving exact details of the method of yellow fever vaccination advocated by the author and the results of its application in French West Africa.

This method of giving three injections of living mouse virus, attenuated by keeping the infected brains at 20°C. for one, two and four days respectively, has now been applied to thousands of volunteers in various French territories during the past five months, and apart from a slight reaction without fever on the 5th to the 8th day, or a febrile reaction on the 6th day, only two cases have shown any nervous symptoms. Both these recovered and all the other reactions were benign.

In a general discussion of this method the author points out that the results of its application in the field, show that it is unnecessary to accompany the vaccination with a dose of immune serum. In regions where the transmitting mosquito abounded, vaccination has not been followed by any cases of yellow fever, and in two regions, the Ivory Coast and Niger Territory, where the disease existed, vaccination did not result in any recrudescence of the epidemics. The duration of the immunity has now been tested up to three years, but the author recommends that the vaccination should be repeated every two years. *E. H.*

LAIGRET (J.) & BONEAU (E.). Longue persistance de l'immunité conférée par la vaccination de la fièvre jaune. [**The Long Duration of Immunity produced by Yellow Fever Vaccination.**]—*C. R. Acad. Sci.* 1936. Jan. 13. Vol. 202. No. 2. pp. 172–175.

The authors have tested the immunity of five patients who had been vaccinated against yellow fever by the inoculation of living mouse

virus, at intervals ranging from 8 months to 4 years. One of these patients had been vaccinated by a single dose of "coated" vaccine eight months previously [see this *Bulletin*, 1935, Vol. 32, p. 880]. It is stated that in each case there was no diminution in the immunity, the serum always containing at least 6,400 protective units per cubic centimetre. *E. H.*

MATHIS (C.), DURIEUX (C.) & ADVIER (M.). La vaccination anti-amarile comporte-t-elle des dangers dans les régions où la fièvre jaune sévit endémiquement et où les "Stegomyia" abondent? (Deuxième note.) [**Is Yellow Fever Vaccination Dangerous in Regions where Yellow Fever is Endemic and where *Stegomyia* is Common? Second Note.**]—*Bull. Acad. Méd.* 1935. Dec. 3. 99th Year. 3rd Ser. Vol. 114. No. 39. pp. 510–520.

After a general discussion of the problem an account is given of four experiments in which mosquitoes were fed first on patients that had received six consecutive vaccinating doses, amounting to 22 mgm. of infected mouse brain instead of the usual 2 mgm., and subsequently on normal human subjects.

In the first experiment the three natives were inoculated with the above mentioned six doses and whilst undergoing this treatment various batches of mosquitoes, *Aëdes aegypti*, were fed on them each day from the 2nd to the 15th day after the treatment had begun. These (156) mosquitoes were fed on a normal subject 14 to 17 days later who was subsequently bitten by a second lot of mosquitoes fed on other vaccinated persons, in both cases without producing any signs of yellow fever infection. Four other subjects were exposed to the bites of mosquitoes that had been fed similarly on vaccinated persons, also with negative results.

The authors conclude, therefore, that there is no danger of yellow fever being transmitted from vaccinated subjects by the bites of mosquitoes. *E. H.*

FINDLAY (G. M.) & STERN (Ruby O.). **The Essential Neurotropism of the Yellow Fever Virus.**—*Jl. Path. & Bact.* 1935. Nov. Vol. 41. No. 3. pp. 431–438.

An interesting account of experiments showing that the virus of yellow fever possesses an inherent neurotropic capacity, even in a species like the *rhesus* monkey, which is normally highly susceptible to the ordinary viscerotropic virus.

When this latter type of virus is instilled intranasally into *rhesus* monkeys it produces ordinary yellow fever but in mice gives rise to encephalomyelitis. If a *rhesus* monkey is inoculated intracerebrally with the same virus *after* a subcutaneous injection of yellow fever immune serum, it develops encephalitic symptoms associated with microglial proliferation, perivascular infiltration and intranuclear inclusions in the brain, and only slight lesions in the liver. However, if the monkey is inoculated with the virus *before* the immune serum, it does not develop encephalitic symptoms, but dies of ordinary yellow fever, the only brain lesion being microglial proliferation.

In *rhesus* monkeys dying of encephalitis as a result of intracerebral inoculation of viscerotropic virus, at death virus is found only in the brain, and not in the blood or liver where it has apparently been neutralized by the subcutaneous injection of immune serum.

These results provide additional evidence in support of the view that neurotropic potentialities are inherent in the ordinary strain of yellow fever virus and suggest that natural selection tends to favour the multiplication of virus particles specially adapted either to growth in the viscera, or to growth in the nervous tissues, according to the particular environment (*i.e.*, tissue) in which the virus is placed.

E. H.

HOSKINS (Meredith). **Treatment of Experimental Yellow Fever Encephalitis with Specific Immune Serum.**—*Amer. Jl. Trop. Med.* 1935. Sept. Vol. 15. No. 5. pp. 545–549.

The title of this paper is somewhat misleading as actually the immune serum was inoculated into *rhesus* monkeys 3, 4 or 6 hours before a subsequent intracerebral injection of neurotropic yellow fever virus.

The immune serum was inoculated into the cisterna after withdrawing a similar volume of cerebrospinal fluid. Doses of 1·75 cc. up to 6·0 cc. were used and obviously affected the course of the disease which was significantly longer than in the controls ; also 6 out of 31 test animals survived. *E. H.*

HOSKINS (Meredith). **A Protective Action of Neurotropic against Viscerotropic Yellow Fever Virus in** *Macacus rhesus*.—*Amer. Jl. Trop. Med.* 1935. Nov. Vol. 15. No. 6. pp. 675–680.

A record of experiments with *rhesus* monkeys inoculated simultaneously and at intervals up to 48 hours with both types of virus—the viscerotropic virus being inoculated first.

The results are summarized in the following table :—

Interval between inoculation of viscerotropic and neurotropic virus	Fate of Test Monkeys				Total
	Number survived	Number died of			
		Viscerotropic Yellow Fever	Yellow Fever Encephalitis	Intercurrent Infections	
Hours					
0	13	1	1	3	18
16	3	0	0	0	3
19	2	0	0	0	2
21	0	1	0	0	1
24	7	8	0	1	16
30	1	1	0	0	2
48	1	5	0	0	6
Total ...	27	16	1	4	48

It is obvious, therefore, that neurotropic virus has a definite protective effect when administered simultaneously with viscerotropic virus and to a lesser extent when administered up to 24 hours afterwards. There is no adequate explanation for these rather surprising results. *E. H.*

SMITH (E. C.). **Nigerian Insectivora (Hedgehogs and Shrews)—their Reaction to Neurotropic Yellow Fever Virus.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Jan. 25. Vol. 29. No. 4. pp. 413–416. With 4 figs. on 1 plate.

The author shows that hedgehogs (*Atelerix albiventris*) from Northern Nigeria are susceptible to the neurotropic strain of yellow fever virus when inoculated intracerebrally ; shrews (*Crocidura manni*) obtained in Southern Nigeria were not susceptible to the same virus.

Thirteen hedgehogs were inoculated intracerebrally and all showed paralytic symptoms, 7 of them dying (or being killed *in extremis*) after an average period of 10·5 days from the time of inoculation. The pathological changes in the brain were typical and in addition necrotic changes were present in the liver of two of the animals examined. Four hedgehogs inoculated subcutaneously gave entirely negative results. Eight shrews inoculated intracerebrally and four subcutaneously with the same virus gave negative results and a protection test with the pooled sera of four normal shrews was also negative.

E. H.

FINDLAY (G. M.) & MAHAFFY (A. F.). **The Susceptibility of Nigerian Hedgehogs to Yellow Fever.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Jan. 25. Vol. 29. No. 4. pp. 417–418.

Six Nigerian hedgehogs, probably *Atelerix albiventris*, from Kano, Northern Nigeria, were found to be highly resistant to infection with viscerotropic yellow fever virus, as tested by both intraperitoneal and intracerebral inoculations.

This resistance was not due to the presence of immune bodies in the blood previous to inoculation, and is in marked contrast to the susceptibility of the hedgehogs from Omdurman, Anglo-Egyptian Sudan, which are supposed to be the same species. It is suggested that there may be a physiological difference between the Sudanese and Nigerian hedgehogs. It is of interest that the susceptible hedgehogs came from a region where yellow fever has never been known to occur, whilst the resistant animals came from Kano, where epidemics of yellow fever are not uncommon and the disease may be endemic. *E. H.*

SALEUN (G.) & CECCALDI (J.). Apport du virus amaril " souris " en A.E.F. [**Store of Yellow Fever " Mouse " Virus in French Equatorial Africa.**]—*Bull. Soc. Path. Exot.* 1935. Oct. 9. Vol. 28. No. 8. pp. 693–695.

A brief record of infection experiments with a neurotropic strain of yellow fever obtained from Dakar which has undergone 18 mouse passages at Brazzaville, and previously 204 passages at Dakar. The material was brought from Dakar in the form of infected mouse brains in a thermos flask and kept in the cold room during the voyage. When tested there was a slight alteration in virulence which was restored after a few mouse passages.

The authors have made a few inconclusive sero-protection tests in the Congo, and hope to use the virus for further studies of the disease in Equatorial Africa. *E. H.*

ZANETTI (V.). La lutte contre les moustiques à Matadi en 1933. [**The Anti-Mosquito Campaign at Matadi in 1933.**]—*Ann. Soc. Belge de Méd. Trop.* 1935. Mar. 31. Vol. 15. No. 1. pp. 127–154. With 1 chart.

Energetic measures, adopted as a result of an epidemic of yellow fever in 1928, have produced a radical transformation in the sanitary condition of Matadi, the port of the entire Congo basin. For Matadi and the vicinity, the sole natural mosquito breeding places are two main ravines and a number of subsidiary ones, for in the swiftly flowing Congo, with its steep banks, breeding is impossible. Within the urban area, part of the ravines have been rendered permanently safe by being floored with cement; in the dry season other ravines are regularly cleared and oiled, under the bi-weekly supervision of a maintenance squad. During the rains, unless scoured out by a fresh downpour within seven days, residual breeding places are either suppressed or oiled. The necessity of unremitting supervision is emphasized. In 1928 the ravines, with domestic breeding places, formed the two main problems; they are now devoid of danger, since each breeding centre is at once located and dealt with. Tree-inspection is not neglected, and holes in papaw trunks, a favourite breeding place of Aëdes [see this *Bulletin*, 1934, Vol. 31, p. 503], are filled in with tar cement. In the urban zone the predominant anopheline is *A. gambiae* (*costalis*), which as its breeding places are suppressed tends to be replaced by *A. rhodesiensis*.

Though permanent and minor sanitary measures, including maintenance of the latter, should be employed together and are mutually complementary, it is suggested that recourse should always be had at the outset to the lesser methods of mosquito control, permanent measures being adopted only when justified by the cost of labour and material necessary to carry out and maintain work of the other kind. For the purpose of maintenance, the surest and most economical weapon is fuel oil. *E. E. A.*

SYMES (C. B.). **Insects in Aeroplanes. A Brief Report and Suggestions.**—*Records of Med. Res. Lab., Nairobi* (*Entomological Section*) *No. 6.* 1935. 16 pp. With 4 figs. Nairobi: Govt. Printer.

The author is concerned with the possibility that aeroplanes may import certain dangerous insects, particularly mosquitoes infected with the virus of yellow fever, into Kenya. He discusses methods of ridding aeroplanes of insects.

Aëdes aegypti is widely distributed in East Africa and a list of localities in which it is known to occur is given, though the author does not state whether it is still an urban insect or widely distributed in the countryside. As yellow fever has been recorded in the Bahr el Ghazal it is clear that there is a real danger of the carriage of an infected mosquito over long distances, and it has been shown that the carriage of mosquitos in aeroplanes is not rare. The author gives details obtained by searching aeroplanes on arrival in Kenya from various directions. Considerably over one hundred machines have been searched, some of which were apparently free of insects: but others contained considerable numbers of insects, mainly mosquitoes, though no example of *Aëdes aegypti* has actually been detected. Attention is called to the fact that Kisumu is a place at which mosquitoes are particularly likely to board planes.

In the Sudan and East Africa the destruction of mosquitoes in planes is generally carried out by an insecticidal spray and an atomizer. The author describes attempts to disinfest planes by short exposures to high concentrations of hydrocyanic acid. The results are not very satisfactory because the structure of an aeroplane is so complex and because so many parts of it are not readily accessible.

P. A. Buxton.

BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1935. Mar. Vol. 27. No. 3. pp. 550–560.—Sur la destruction des moustiques à bord des aéronefs. [**The Destruction of Mosquitoes in Aircraft.**] [GRIFFITTS (T. H. D.) & MICHEL (Carl), U.S. Pub. Health Service.]

The United States Public Health Service having proved conclusively that *Aëdes aegypti* can be carried by aircraft for long distances, and on flights lasting three or more days, the necessity of destroying these insects in aeroplanes is insisted upon. Either a fumigant (the more radical method) or a spray can be used, the latter being employed in the various compartments of the machine before departure, during flight, at stopping places and at the end of the trip. Among fumigants certain preparations of hydrocyanic acid (HCN) give the best results, and the use of " discoids " (discs of unglazed paper soaked with liquid HCN) or " Zyklon " (fuller's earth similarly impregnated) is recommended ; in both forms it can be employed easily and without danger, according to the method described, by a skilled fumigator. Half an ounce of HCN per 1,000 cubic feet may be regarded as the maximal dose for the killing of mosquitoes, but stronger concentrations may be used, especially when it is desired to destroy rodents, and also insects such as cockroaches and flies.

Carboxide, a gas containing 1 part of ethylene oxide and 9 parts of carbonic acid, is likewise efficacious, but less so than HCN, and is slightly toxic to man.

The most effective spraying fluids, the necessary properties of which are discussed at some length, are those containing a good strong extract of pyrethrum, usually dissolved in some form of petroleum. A concentrated and standardized extract of this kind, known commercially as " Pyrocide 40," consists of 4·3 gm. of pyrethrin (the active principle of pyrethrum flowers, obtained by means of ethylene dichloride) dissolved in 100 cc. of mineral oil of the kerosene type. For use, a 4 per cent. dilution of Pyrocide 40 in mineral spirit, or a mixture of 1 gallon of concentrated extract of pyrethrum and 7 gallons of commercial " water white kerosene " is employed, without interfering in any way with the comfort of passengers, or affecting the working of the machine.

E. E. Austen.

WILLIAMS (C. L.) & DREESSEN (W. C.). **The Destruction of Mosquitoes in Airplanes. A Preliminary Note.**—*Public Health. Rep.* 1935. May 17. Vol. 50. No. 20. pp. 663–671.

The fundamental problem with which this paper is concerned is the prevention of the spread of yellow fever by aerial travel. For the destruction of mosquitoes in aeroplanes by means of a fumigant, the latter, since it may have to be employed *en route*, must be light, rapid and certain in action, and innocuous to human beings. In a series of experiments the authors tested the effect on *Aëdes aegypti* of carboxide

(1 part ethylene oxide + 9 parts carbon dioxide) and of pyrethrum extract.

For more than one reason, including the weight of the necessary container, carboxide proved unsatisfactory, but :—" A concentrated oil extract of pyrethrum flowers containing 2 grams of pyrethrins per 100 cc. is highly effective against *Aëdes aegypti* when brought in contact with them in the form of a very fine spray, the lethal concentration apparently being somewhere between 2 and 4 grams per 1,000 cubic feet." Such a spray, in view of the small amount required, is suitable for use in a moving plane, and is believed to be harmless to human beings. Mosquitoes fumigated therewith do not immediately die; whether they are able to bite before expiring remains to be proved.

E. E. A.

WILLIAMS (C. L.) & DREESSEN (W. C.). **A Nonflammable Pyrethrum Spray for Use in Airplanes.**—*Public Health Rep.* 1935. Oct. 11. Vol. 50. No. 41. pp. 1401–1404. [Summary appears also in *Bulletin of Hygiene.*]

The development of international travel by air has increased the risk of the spread of yellow fever, and if this is to be prevented without serious delay to aircraft it is essential to find a means of killing mosquitoes in aeroplanes in flight without danger to the passengers or crew.

A solution of 2 gm. pyrethrins in 100 cc. of kerosene delivered in a fine spray to the amount of 2–4 gm. per 1,000 cubic feet is effective but inflammable. Experiments were therefore made with non-inflammable mixtures. Of a 2 per cent. solution of pyrethrins in carbon-tetrachloride 40 to 60 cc. per 1,000 cubic feet were required to kill *Aëdes aegypti*, but this caused irritation of the nose and throat, dizziness, faintness and headache in persons exposed to its effects. Mixtures of 2 per cent. pyrethrins in kerosene and 2 per cent. pyrethrins in carbon-tetrachloride were next tried, and it was found that a mixture of 1 part of the former with 4 of the latter killed 100 per cent. of *Aëdes aegypti* in five minutes, when sprayed in amounts of 5 cc. per 1,000 cubic feet. This mixture proved by ordinary tests to be non-inflammable.

Later experiments showed that a mixture of 1 part of solution of 2 per cent. pyrethrins in kerosene and 4 parts of carbon-tetrachloride without pyrethrins gave equally good results, all *Aëdes aegypti* being killed by 5 minutes' exposure to a concentration of 5 cc. per 1,000 cubic feet. The mixture appears to be non-inflammable and to cause no inconvenience to persons exposed to concentrations of 10 cc. per 1,000 cubic feet for 15 minutes. The fact that it was so efficient in spite of the fact that it contained not more than 0·4 per cent. pyrethrins caused some surprise, but it was subsequently shown that a kerosene extract containing 0·4 per cent. pyrethrins is about as effective against *Aëdes aegypti* as one containing 2 per cent. of pyrethrins.

Chas. F. White.

TREILLARD (M.). Tableau synoptique pour la détermination rapide de toutes les espèces du sous-genre *Stegomyia.* [**Synoptic Table for the Rapid Determination of the Species of the Sub-Genus Stegomyia.**]—*Bull. Soc. Path. Exot.* 1935. Apr. 10. Vol. 28. No. 4. pp. 291–292. With 1 folding fig.

This is an attempt at simplifying the recognition of species belonging to the subgenus *Stegomyia* in all parts of the world. It consists of a

synoptic figure and not a dichotomous key. The arrangement is very easy to use; and it reveals very clearly the geographical distribution of the various species. But there are insects belonging to other subgenera of *Aëdes* (notably *Finlaya*) which the inexpert is very liable to put into *Stegomyia* and so to arrive at quite wrong diagnosis. The characters of the subgenus are not given. *V. B. Wigglesworth.*

GIL COLLADO (J.). Nuevos datos sobre la distribución del *Aëdes* (*stegomyia*) *vittatus* en España con algunas notas acerca de su biologia. [*Aëdes vittatus*: **its Biology and Distribution in Spain.**]—*Medicina Países Cálidos.* Madrid. 1935. Jan. Vol. 8. No. 1. pp. 61–64. [11 refs.]

All the specimens of *Aëdes vittatus* captured, whether larval or adult, were found during the latter half of September and the whole of October, which is probably therefore the time of its greatest activity. In contrast with *Aëdes aegypti* it does not hide in human dwellings and in the Province of Cáceres and even more in that of Salamanca the nearest houses were a long way from the place of capture. Other specimens were sent from the swampy region of Cijara in Badajoz Province.

The breeding sites were most commonly hollows in rocks, nearly always quite small but relatively deep, as if the females had chosen collections of water with small surface in relation to volume to guard against drying up and evaporation. These foci did not contain growing vegetation, but were often of a dark, almost coffee, colour from the quantity of decomposing matter. They are found at various altitudes, *e.g.*, at La Fregeneda and Alcolea about 1,000 metres and at Guijo (900) and La Granja (1,100). The distances separating these places indicate that this species is more widely spread than is generally believed. *H. H. S.*

EVANS (A. M.) & WALKER (G. R.). Notes on Brazilian Mosquitoes: Species observed in the Amazon Valley, and Record of *Aëdes albifasciatus* Macq. invading a Ship in Harbour.—*Ann. Trop. Med. & Parasit.* 1935. Dec. 18. Vol. 29. No. 4. pp. 463–467. With 1 fig.

RELAPSING FEVER AND OTHER SPIROCHAETOSES.

KEMP (Hardy A.), MOURSUND (W. H.) & WRIGHT (H. E.). **Relapsing Fever in Texas. V. A Survey of the Epidemiology and Clinical Manifestations of the Disease as it occurs in Texas.**—*Amer. Jl. Trop. Med.* 1935. Sept. Vol. 15. No. 5. pp. 495–506. With 3 figs.

A detailed study of the subject based largely on the co-operation of over 600 Texas physicians from all parts of the State, who sent replies to a carefully worded questionary.

The results indicate that during 1930 to 1934 inclusive there were 258 reported cases of relapsing fever in Texas. Spirochaetes were found in 80 of these patients, and in the others the diagnosis seems well established by clinical symptoms and by the specific response to anti-spirochaetal treatment. Practically all these cases occurred amongst farm and ranch people, the exceptions among city dwellers being those who might have acquired the disease during some trip to rural districts. The seasonal incidence, late summer and autumn, coincides with the activity of *Ornithodorus turicata* and the disease is restricted to tick-infested localities within a given district.

The symptoms of the disease include a very sudden onset during which the temperature may rise to 105° or 106°F. In the absence of treatment there is little or no abatement in temperature during the next three relapses, after which they become less severe. The length of the afebrile period is irregular in severe cases, but in others is often 4 to 5 days. A macular rash is present in about half the cases but there seems no correlation between this and the severity of the disease. Splenic enlargement and tenderness are common. Liver enlargement is infrequent and jaundice rather uncommon. The only common sequelae were myalgia and a stubborn muscular asthenia. The infections were often cured by single doses of 0·01 gm. per kilo body weight of neosalvarsan. No fatal cases were reported. *E. Hindle.*

HERMS (W. B.) & WHEELER (C. M.). **Tick Transmission of California Relapsing Fever.**—*Jl. Econom. Entom.* 1935. Dec. Vol. 28. No. 6. pp. 846–855. With 1 fig. [16 refs.]

A general review of the subject, including a brief survey of the five species of the ticks of the genus *Ornithodorus* occurring in California, *viz.*, *O. coriaceus*. *O. turicata*, *O. talaje*, *O.* (*Otobius*) *megnini* and *O. hermsi*, followed by the results of laboratory investigations on the tick transmission of the Californian strain of relapsing fever.

Attempts to transmit this strain from infected to normal white mice by the bites of both nymphs and adults of *Ornithodorus coriaceus* gave negative results. Similar negative results, with one doubtful exception, were also obtained by the inoculation of the ground-up contents of these ticks into normal mice. With *Ornithodorus hermsi*, a total of 39 feeding tests conducted on white mice resulted in 11 positive transmissions, with both adult and late nymphal stages. Moreover, as previously noted [*ante*, p. 55], this species has been definitely proved to be infective in nature in the neighbourhood of Big Bear Lake, California.

Finally, an account is given of the infection with relapsing fever contracted in the field at Packer Lake, Sierra County, by one of the authors (C. M. W.). *E. H.*

HERMS (W. B.) & WHEELER (C. M.). *Ornithodorus hermsi* **Wheeler as a Vector of Relapsing Fever in California.** [Abstract.]—*Jl. Parasitology.* 1935. Dec. Vol. 21. No. 6. p. 440.

"This new species of tick is found at elevations ranging from about 5,000 to 8,000 feet in California and is commonly found in the nests of chipmunks, proven reservoirs of the spirochaete of relapsing fever. Ticks taken in nature in cottages where cases have occurred when allowed to bite white mice transmitted the spirochaetes. Transmission is effected by the bite of both female and male ticks and in all instars, spirochaetes being observed in the blood of white mice usually about 5 days after the infective bite. A small percentage, probably less than fifteen per cent. of the offspring of infective females are able to transmit the disease, thus proving hereditary transmission. When clean ticks are fed on experimentally inoculated mice, the percentage of ticks becoming infective appears to be about thirty per cent., based on rather meagre experimental data. *Ornithodorus hermsi* deposits well over 200 eggs in a given season, from May to October. The incubation period ranges from 15 to 21 days at a temperature of 75°F. and humidity at about 90 per cent. The time required for the several instars depends on the opportunity to feed. After each feeding, requiring about 15 minutes, occasionally as long as 30 minutes, there is a moult, maturity being reached after the fifth including the first which is effected before hatching. The cycle from egg to egg under optimum conditions requires about four months."

WHEELER (Charles M.). A New Species of Tick which is a Vector of Relapsing Fever in California.—*Amer. Jl. Trop. Med.* 1935. July. Vol. 15. No. 4. pp. 435–438.

SERGENT (André) & LÉVY (H.). Spirochétose hispano-africaine chez un homme piqué par une tique du chien (*Rhipicephalus sanguineus*). [**Spanish-African Relapsing Fever in a Man Bitten by a Dog Tick** (*R. sanguineus*).]—*Bull. Soc. Path. Exot.* 1935. Nov. 13. Vol. 28. No. 9. pp. 789–790.

The record of a case of relapsing fever in Algeria, in which the patient developed the attack 18 days after having been bitten by a dog tick, *Rhipicephalus sanguineus*.

The spirochaete was isolated by inoculating the patient's blood into guineapigs and found to be *Spirochaeta hispanica*, the third case of this infection in Algeria that has been confirmed by laboratory examination. The general evidence supports the view that the dog tick was responsible for the infection. *E. H.*

CANO (Martin) & PASCUAL (Alonso). Un caso de iridociclitis por fiebre recurrente española.—*Medicina Países Cálidos.* Madrid. 1935. May. Vol. 8. No. 5. pp. 247–248.

MEDULLA (Candido). Sulla dibattuta questione della presenza della ricorrente da *Spironema duttoni* in Cirenaica. [**On the Disputed Question of the Existence of Relapsing Fever in Cyrenaica.**]—*Arch. Ital. Sci. Med. Colon.* 1935. Oct. Vol. 16. No. 10. pp. 755–759. With 2 figs.

The following account should remove the question beyond the realm of dispute. A man living in Apollonia (Cyrenaica) was bitten on the

left arm by a tick (? *O. savignyi*) and a few days later fell sick with shivering, intense headache, general pains, temperature 39·4°C., palpable spleen, occasional bilious vomiting. Examination of the blood showed numerous spirochaetes. He was treated with neoiacol and recovered.

The doctor who gave the injection accidentally pricked himself with the syringe which was soiled with blood from this patient. In spite of local application of antiseptic, he was attacked 5 days later and showed the same symptoms as those above. Examination of his blood was also positive for spirochaetes. Neoiacol, 0·2 gm. intramuscularly on alternate days and later 0·3 gm. with two-day intervals effected a cure.

H. H. S.

MEDULLA (Candido). Nuovo contributo allo studio della febbre ricorrente in Cirenaica. [**Further Case of Relapsing Fever in Cyrenaica.**]—*Arch. Ital. Sci. Med. Colon.* 1935. Aug. 1. Vol. 16. No. 8. pp. 610–615. With 3 charts & 1 fig. English summary (3 lines).

The author recorded cases of relapsing fever on former occasions in Cyrenaica [see this *Bulletin*, 1934, Vol. 31, p. 853] and now describes three more. A noteworthy point is that in two of them facial paralysis developed, one 12 days after a febrile access, the other on the next day after. In the latter there was also paralysis of the hypoglossal nerve. [The first may have been a coincidence, since the interval was of some length, but the condition is one to look out for; it may be a more frequent complication or sequela than is generally believed.]

H. H. S.

LATYCHEV (N.). Découverte des spirochètes patogènes pour l'homme chez les rongeurs sauvages dans la vallée de la rivière Mourgab (Turkménie). [**Spirochaetes Pathogenic for Man discovered in Wild Rodents of the Mourgab Valley, Turkmenistan, U.S.S.R.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1935. Vol. 4. No. 5. [In Russian pp. 417–420. With 3 figs. French summary p. 420.]

The author examined wild rodents, *Rhombomys opimus* (? Sand-eel), inhabiting the mountain slopes and valleys near the River Mourgab by Tachta-Bazar, Turkmenistan, and in more than 12 per cent. of them he found spirochaetes in the blood. Inoculation of this blood into the skin [of the author himself ?] resulted in an attack of relapsing fever after an incubation period of 14 days; there were 9 attacks of fever [the length of the apyrexial periods are not stated in the French summary from which this abstract is made] accompanied by enlargement of the spleen. In each of the recurrences of fever the spirochaetes were present but only in the early days of the afebrile intervals. These spirochaetes were found also in 5 per cent. of the local bats, *Rhinophus* sp. [In the French summary there is no statement as to the identity of the spirochaetes; from the relapsing character of the infection one would expect *Spirillum minus* of rat-bite fever. *Spirochaeta icterohaemorrhagiae* and *Spirochaeta hebdomadis* do not cause a series of febrile attacks such as are mentioned in the summary.]

H. H. S.

LEPTOSPIROSIS.

i. MOLLARET (Pierre) & ERBER (Berthe). A propos du diagnostic microbiologique de la spirochétose méningée pure. [**The Microbiological Diagnosis of Simple Spirochaetal Meningitis.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Dec. 9. 51st Year. 3rd Ser. No. 31. pp. 1632–1637.

ii —— & ——. Contribution à l'étude physio-pathologique de la spirochétose méningée pure. [**A Contribution to the Pathology and Physical Signs of Simple Spirochaetal Meningitis.**]—*Ibid.* pp. 1638–1643. With 1 chart.

i. The authors call attention to the relative frequency of cases of simple meningitic forms of spirochaetal jaundice, for during 1935 about a score of such cases were diagnosed at the Pasteur Institute in Paris.

Sero-diagnostic methods are recommended as the simplest and most effective means of recognizing these meningitic cases and examples are given of the results of serum tests on three such infections in children. The results are given below in tabular form and show that the meningitic type is not specially associated with water strains.

	S. icterohaemorrhagiae (Verdun Strain)	*S. hebdomadis*	*S. autumnalis* A.	*S. autumnalis* B.	Rachmat Strain (India)	*Lept. canicola* (Utrecht IV)	Water strains		
							Erlangen	Tokio	Vinzent
M	1/100,000	0	1/10	0	1/100	1/50	1/10	1/10	0
B	1/5,000,000	0	0	0	1/10	1/10,000	1/50	1/50	1/10
Br.	1/5,000,000	0	0	0	1/100	1/100	1/100	1/500	1/10

ii. An examination of the cerebrospinal fluid of the above mentioned cases showed that antibodies were absent even though all three were typical cases of simple spirochaetal meningitis. In a discussion of the problem it is insisted that by physical signs there is no means of distinguishing between the meningitic reactions in cases of simple spirochaetal jaundice and those of simple spirochaetal meningitis. There are the same modifications in the cerebrospinal fluid, the same discrepancies between the agglutination titre of the blood and cerebrospinal fluid, and also the same impermeability to fuchsin as tested in a baboon, inoculated by means of lumbar puncture with 1 cc. of a culture of *S. icterohemorrhagiae.*

This symptom is not considered to indicate any special type of infection or any particular strain of spirochaete, but merely another clinical feature of ordinary spirochaetal jaundice, which may or may not be present.

E. Hindle.

MARIE (Julien) & GABRIEL (Pierre). La méningite spirochétosique épidémique chez l'enfant. [**Spirochaetal Meningitis Epidemic in Children.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Nov. 18. 51st Year. 3rd Ser. No. 28. pp. 1454–1465.

A detailed description of three cases of meningitis occurring in children, due to infection with *S. icterohaemorrhagiae.* The patients were

aged 10, 12 and 13 years, respectively, and this seems to be the first record of spirochaetal meningitis assuming an epidemic character in children. The cases occurred during August and September, and it is suggested that bathing may have been responsible for the infection. The symptoms were an acute febrile meningitis, with a sudden onset. The cerebrospinal fluid showed a marked cellular reaction which persisted for about four weeks, whilst there was only a slight rise in albumin, which returned to the normal by the tenth day. All three patients recovered in a few days without any sequelae and without having shown any jaundice.

There was no certain clinical sign indicating the spirochaetal nature of the disease, and this was only detected by obtaining positive serodiagnostic tests and also by infecting guineapigs by the inoculation of urine from one of the patients.

The disease is probably more widespread than these few records would suggest and acute meningitic cases in children, especially during the summer, should be examined both serologically and by the inoculation of urine into guineapigs. *E. H.*

GUILLAIN (Georges) & LEREBOULLET (Jean). Spirochétose méningée pure à forme mentale. [**A Mental Form of Simple Spirochaetal Meningitis.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Nov. 18. 51st Year. 3rd Ser. No. 28. pp. 1509–1512.

The description of an epileptic patient who in the course of one of his attacks fell into the Seine and subsequently developed a state of torpor associated with asthenia and amnesia and accompanied by fever.

Serodiagnostic tests confirmed the view that this patient became infected with a simple meningitic form of spirochaetosis after immersion in the river, and the psychic troubles seem to have been connected with the infection, since they disappeared completely as soon as the patient had recovered from the spirochaetal infection. *E. H.*

LABBÉ (M.), BOULIN, UHRY & ULLMAN. Sur un cas de spirochétose ictérigène accompagnée de paraplégie. [**A Case of Spirochaetal Jaundice accompanied by Paraplegia.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Nov. 18. 51st Year. 3rd Ser. No. 28. pp. 1504–1509. [16 refs.]

The description of a fatal case of infection with *S. icterohaemorrhagiae* which showed typical symptoms of severe jaundice and nephritis, accompanied by paraplegia.

The main interest of this case lies in whether the spirochaetes were responsible for the neurological syndrome, and after considering previous records in Japan, together with the severity of the case and the early infectivity of the urine (on the 7th day), the author concludes that the spirochaete probably was responsible for the development of the paraplegia. *E. H.*

MOLLARET (Pierre) & FERROIR (Jean). A propos de deux observations de spirochétose ictéro-hémorragique dont une avec myocardite mortelle. Contribution à l'étude de la réaction méningée des formes typiques ictérigènes. [**Two Cases of Spirochaetal**

Jaundice, one with Fatal Myocarditis. A Study of the Meningitic Reaction in Typically Jaundiced Cases.]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Dec. 9. 51st Year. 3rd Ser. No. 31. pp. 1622–1631. With 5 figs.

A detailed account of two cases of infection with spirochaetal jaundice in Paris, both of which showed distinct meningitic reactions, in one case evidenced by the clinical symptoms and in the other by modifications in the cerebrospinal fluid.

This relative independence between the clinical signs and changes in the fluid seems to be an important feature of this type of infection. It is associated with a predominance of cytological modifications rather than albuminorachia and also with characteristic changes in the colloidal benzoin reaction.

The various modifications in the cerebrospinal fluid in some cases seem to be merely a reflexion of the changes in the blood, and meningitic symptoms may occur almost without the development of antibodies in the subarachnoidal region. *E. H.*

MARCHAL (Georges), SOULIE (P.) & ROY (A.). Spirochétose ictéro-hémorragique. Troubles cardiaques et modifications électro-cardiographiques. [**Spirochaetal Jaundice. Cardiac Symptoms and Electrocardiographic Changes.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Dec. 9. 51st Year. 3rd Ser. No. 31. pp. 1651–1654.

A description of a case of infection with *S. icterohaemorrhagiae*, in which the patient showed symptoms of myocarditis, which were also recognized by examination with the electrocardiograph. *E. H.*

KOURILSKY (Raoul) & MAMOU (H.). Les formes " pseudogrippales " de la spirochétose anictérique. [**Forms of Spirochaetal Infection without Jaundice simulating Influenza.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Nov. 18. 51st Year. 3rd Ser. No. 28. pp. 1514–1519.

The description of two cases of infection with *S. icterohaemorrhagiae*, identified by sero-diagnostic tests, neither of which showed any jaundice or meningitis, but symptoms suggesting influenza, such as fever and backache, accompanied by redness of the pharynx, erythematous stomatitis, etc.

Both the patients were in the habit of river bathing and the infections occurred in the summer, and in view of the many atypical forms of this disease, the authors are of the opinion that cases of " influenza " occurring in the summer should be viewed with suspicion as possible atypical forms of spirochaetal jaundice. *E. H.*

TROISIER (Jean), BARIÉTY (Maurice) & MACREZ (Cl.). Spirochétose ictéro-hémorragique fébrile pure [Leptospirose fébrile pure]. [**Simple Febrile Spirochaetal Jaundice (Simple Febrile Leptospirosis).**]—*Bull. et Mém. Soc. Méd. Hôpit de Paris.* 1935. Nov. 18. 51st Year. 3rd Ser. No. 28. pp. 1465–1470. With 1 chart.

The description of the case of a patient who apart from a severe injection of the conjunctivae, showed no other clinical symptoms except a typical febrile syndrome. There was no trace of jaundice, haemorrhages, nor any meningitic syndrome, but the inoculation of the

cerebrospinal fluid, collected on the 6th day, into a guineapig resulted in the production of a typical and fatal infection with *S. icterohaemorrhagiae.* Serodiagnostic tests of the patient's blood were negative on the 6th day, but were positive on the 12th day. *E. H.*

CAIN (André), CATTAN (Roger) & BENSAUDE (Alfred). Trois cas atypiques de spirochétose ictéro-hémorragique. [**Three Atypical Cases of Spirochaetal Jaundice.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Nov. 18. 51st Year. 3rd Ser. No. 28. pp. 1470–1475.

The description of three cases of infection with *S. icterohaemorrhagiae,* the first simulating catarrhal jaundice, the second a pseudo-typhoid, and the third showing hardly any definite clinical symptoms, beyond three to four days of fever, accompanied by certain digestive troubles.

Injection of the conjunctivae was a constant feature, and all three patients were in the habit of bathing in the river. The nature of the infection was determined by obtaining positive serodiagnostic tests. *E. H.*

SABRAZÈS (J.), LANNELONGUE (G.), DUTRÉNIT (Jean) & BONNEL. Forme anémique et subictérique de la spirochétose d'Inada-Ido. [**An Anaemic and Sub-Icteric Variety of Spirochaetal Jaundice.**]—*Gaz. hebd. Sci. Méd. de Bordeaux.* 1935. Dec. 22. Vol. 56. No. 51. pp. 807–810.

A description of a case in which during the first 10 days of the infection the number of red cells diminished to a half, accompanied by leucocytosis and considerable arterial hypotension. This was followed by the development of febrile symptoms and jaundice which gradually subsided, but the anaemia has persisted with oscillations for more than four months, without any haemorrhages except slight epistaxis at the beginning of the fever. *E. H.*

HASLE (G.), TOULLEC (F.) & VAUCEL (M.). Spirochétose ictéro-hémorragique et spirochétoses anictériques observées à Hanoi. [**Spirochaetoses with Haemorrhagic Jaundice and also without Jaundice observed in Hanoi.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1935. May. Vol. 13. No. 4. pp. 407–428. With 8 charts.

The authors give a detailed account of 5 cases of typical Weil's disease observed in Hanoï, and then 7 cases in which the clinical symptoms, including the absence of jaundice, separated them off from the preceding. As a result mainly of agglutination tests, this second group of cases would seem to belong to the seven-day fever and autumnal fever caused by *S. hebdomadis.* *E. H.*

CAROLI (Jacques). Un cas d'azotémie fébrile spirochétosique. [**A Case of Febrile Spirochaetosis with Azotaemia.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Nov. 18. 51st Year. 3rd Ser. No. 28. pp. 1513–1514.

The description of the case of a patient, a river bather, who became infected with *S. icterohaemorrhagiae,* as detected by serodiagnosis, but showed merely febrile symptoms accompanied by azotaemia, which returned to normal by the 12th day. *E. H.*

MASSIAS (Charles). Un cas mortel de spirochétose ictérigène à Travinh (Cochinchine). [**A Fatal Case of Spirochaetal Jaundice at Travinh (Cochin China).**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1935. July–Aug. Vol. 13. No. 6. pp. 788–790.

The record of a case of spirochaetal jaundice in an Annamite with typical clinical symptoms, who died on the 7th day of illness. Sero-agglutination and lysis tests were positive for *S. icterohaemorrhagiae.*

E. H.

MASSIAS (C.). Un nouveau cas mortel de spirochétose ictérigène en Cochinchine avec autopsie. [**An Additional Fatal Case of Spirochaetal Jaundice in Cochin China with Autopsy.**]—*Bull. Soc. Path. Exot.* 1935. Nov. 13. Vol. 28. No. 9. pp. 791–792.

The description of a typical case of spirochaetal jaundice in an Annamite, in which the diagnosis was confirmed by the results of autopsy and also by serum-agglutination tests. [See above.]

E. H.

RAGIOT (Ch.), DELBOVE (P.), NGUYEN-VAN-HUONG & HO-THIEU-NGAN. Nouvelle note sur la spirochétose ictérigène en Cochinchine. [**An Additional Note on Spirochaetal Jaundice in Cochin China.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1935. Sept. Vol. 13. No. 7. pp. 817–824.

Clinical observations on five cases of this disease occurring in Cochin China, where the symptoms show the same wide range of variation as in other parts of the world. In four cases the diagnosis was confirmed by blood inoculations into guineapigs and in the fifth by agglutination tests. *E. H.*

WIGMORE (J. B. A.) & DENNING (G. M.). **Leptospiral Jaundice in a Groom.**—*Jl. Roy. Army Med. Corps.* 1936. Jan. Vol. 66. No. 1. pp. 21–26. With 1 chart.

The record of a case in which the infection was almost certainly acquired from a rat by contamination with its blood. Seven days before the onset, the patient was slightly bitten on the finger by a dog that had just killed a rat. The symptoms of the disease were typical and spirochaetes were found in the urine. *E. H.*

BERZI (A.) Forme cliniche di spirochetosi ittero-emorragica.—*Sperimentale.* 1935. Aug.–Oct. Vol. 89. No. 4–5. pp. 535–554. [42 refs.] English summary (10 lines).

ERBER (Berthe). Sérodiagnostic, par agglutination, de la spirochétose ictérohémorragique. Technique et interprétation. [**The Serum Diagnosis, by Agglutination, of Spirochaetal Jaundice. The Method and its Interpretation.**]—*C. R. Soc. Biol.* 1935. Vol. 120. No. 34. pp. 618–622.

Details of the methods used at the Pasteur Institute, Paris, by the author, who has been for many years in charge of the examination of the specimens sent in for sero-diagnosis in cases of suspected spirochaetal jaundice.

A 4-day old culture of the living spirochaete in 20 per cent. rabbit serum in saline was generally used, and it is necessary to examine it by

the dark-ground to see that active spirochaetes are present. If older cultures are used they should be centrifuged for a short time to remove any débris from the medium. The patient's serum should be fresh and clear and when examining cerebrospinal fluid no traces of blood should be present.

For the test three tubes are used: the first receives 0·1 cc. of the undiluted serum, the second 0·1 cc. of the serum diluted 1 : 10, and the third 0·1 cc. diluted 1 : 100; 0·9 cc. of culture is added to each of the tubes and also to a fourth tube, which receives 0·1 cc. of saline and serves as a control. The tubes are kept at 37°C. for one hour before examination. With cerebrospinal fluid, dilutions of 1 : 10, 1 : 50 and 1 : 100 are used. As a rule this test is sufficient to indicate whether the specimen is positive or negative, but in some cases the titre of the serum is of interest and then dilutions up to 1 : 100,000 or more are prepared.

Examination is always made by means of dark-ground illumination using a No. 6 objective and No. 4 eyepiece. With positive sera, dilutions of 1 : 10 generally contain free spirochaetes, but their movements are feeble; in addition there are a few spirochaetes agglutinated in irregular masses. In the 1 : 100 dilutions, there are free spirochaetes and also more or less spherical masses covered with feebly motile spirochaetes undergoing lysis. In the 1 : 1,000 dilution, there are numerous small masses of agglutinating spirochaetes, somewhat resembling the appearance of red blood cells in a hypertonic solution; usually no free spirochaetes are present. If the spirochaetes remain active, even if they agglutinate in the lower dilution, the reaction is doubtful and if a second test with serum collected a few days later gives similar results, it must be regarded as negative.

Agglutination may be observed commonly in dilutions up to 1 : 100,000: but lysis soon disappears in dilutions above 1 : 1,000.

With cerebrospinal fluid doubtful reactions have not been observed since the limit of dilution rarely exceeds 1 : 100, even when the serum of the patient agglutinates in dilutions of 1 : 100,000. *E. H.*

VERGE (J.). Les spirochétoses du chien. [**Dog Spirochaetoses.**]—*Rev. Gén. de Méd. Vét.* 1935. Dec. 15. Vol. 44. No. 528. pp. 705–711.

A brief summary of the supposed spirochaetal infections of the dog including *S. canina*; Stuttgart disease, or haemorrhagic gastro-enteritis, stated to be due to *S. melaenogenes canis*; canine leptospirosis including two strains, *Leptospira icterohaemorrhagiae* and *L. canicola*; and finally infections of fusiform bacilli and spirochaetes. *E. H.*

RAT-BITE FEVER.

CHODZKO (W.). Les premiers cas de sodoku observés en Pologne et en Lithuanie. [**The First Cases of Sodoku observed in Poland and Lithuania.**]—*Bull. Office Internat. d'Hyg. Publique.* 1935. Sept. Vol. 27. No. 9. pp. 1769–1773.

A case of this disease was observed by CZYZEWSKI and BROSS in Poland in 1931, and in addition to a description of this case, the author

also gives an account of three more examples of the disease in Lithuania. The clinical symptoms, pathological findings and treatment were typical. *E. Hindle.*

MÜLLER (Kurt L.). Ein Fall von japanischer Rattenbisskrankheit (Sodoku) in Oberösterreich. [**A Case of Japanese Rat Bite Fever (Sodoku) in Upper Austria.**]—*Wien. Klin. Woch.* 1935. Nov. 22. Vol. 48. No. 47. pp. 1449–1450.

The description of a typical case of rat-bite fever in an Austrian farm servant. The diagnosis was confirmed by inoculation into a guineapig, which showed *S. minus* in its blood. The patient was cured by injections of neosalvarsan, starting with a dose of 0·3 gm., gradually rising on the 8th day to a dose of 0·9 gm., and the author considers that a total of at least 3 gm. should be used in order to avoid any relapses. *E. H.*

TALEC. Sur un nouveau cas de sodoku à Pondichéry. [**A Case of Rat-Bite Fever in Pondichéry.**]—*Ann. de Méd. et de Pharm. Colon.* 1935. July–Aug.–Sept. Vol. 33. No. 3. pp. 838–840.

A woman of 37 years passed through a normal parturition. Three days later she had a rise of temperature and complained of stabbing pain in the right shoulder, which was a little swollen and showed inflamed lymphatics running towards the clavicle and axilla, and a small ulcer in the middle of the swelling. A history was obtained that eight days before coming to hospital, *i.e.*, 11 days previous to the onset of symptoms, she had been bitten by a rat; the wound had healed in 3 days. The fever dropped and the general condition improved after two injections of sulpharsenol and the patient left hospital 14 days after her admission. Three weeks later she had a return of the pain and repeated chills with rise of temperature. She was given 3 injections of Uclarsyl [? composition], 0·15, 0·3 and 0·4 gm. the last two at 4 and 6 days' interval and the symptoms cleared up. She was a nurse at the hospital and has thus been under observation, but so far there has been no further relapse. [There is no statement as to finding or even looking for the spirillum.] *H. H. S.*

BENESTAD (Gunnar). Et tilfelle av rottebittsykdom.—*Norsk Mag. f. Laegevidenskapen.* 1935. July. Vol. 96. No. 7. pp. 729–734. With 2 figs. [10 refs.] English summary.

PLAGUE.

BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1935. Sept. Vol. 27. Supplement to No. 9. 67 pp. With 1 fig. & 2 folding maps. (5 bibliographies.)—La peste africaine [JORGE (Ricardo)]. **[Plague in Africa.]**

This is a valuable monograph, not only for those concerned with plague in one or other part of the African continent, but for students of plague in general. It contains chapters on ancient history, geographical distribution, statistics, vectors, clinical plague and prophylaxis together with two useful maps of the invasions, epidemiological situation and predominant pestigenic rodents in Africa. Much the most interesting chapter, however, is that with the full name of " The pestigenic vectors, rodents and fleas. Common plague and selvatic plague. The rat the flea and man in African plague. Interhuman transmission. The free flea. Zoological map."

Plague is in reality the work of two rats—*Epimys norvegicus* the brown rat, and *Epimys rattus*, the black rat. Whereas the brown rat remains true to type the black rat shows many variations and the variants, such as the *alexandrinus* of Egypt, the *kijabius* of Uganda and the *frugivorus* or *tectorum*, may be more numerous than the type. The two main rat types are domestic rats but can become rural on occasion. By far the most important of the rat fleas is the *Xenopsylla cheopis*. At the present day fleas are sought for not only on the rodents themselves but as free fleas in rodent burrows, in clothing, and in the midst of grain which is in course of transit.

Rodents which are capable of being infected with plague are divided up into the pestiferous and the pestigenic, according as they are practically concerned or not with the transmission of plague. The common mouse for example is a pestifer, very susceptible of plague, but not ordinarily a transmitter. It is the same with fleas. Not every flea is given the " plague charter." Such a distinction will depend upon its capability of attacking man and of developing the necessary proventricular block whereby plague bacilli can be discharged into its skin puncture.

A special place is accorded in Africa and especially South Africa to the plague of the hinterland. Whereas the brown and the black rat are predominantly responsible for the plague of the ports and coast, the former for the north of Africa and the latter for the remainder of the continental littoral, " there is a certain type of plague for which the zoological and geographical origin is different. This plague is not the work of domestic but of wild rodents; it rages not in the inhabited parts of the country but in the uninhabited and as an epizootic." This has been named by Dr. Jorge " selvatic plague." In South Africa the author of this type of plague is the gerbil, *Tatera lobengulae*. By contact of the rat *Rhabdomys pumilio* and the multimammate rat, *Mastomys coucha*, with the gerbils a connexion is established between human habitations of the ports and the inland regions, and so plague is brought to the scattered farms of the veld. The persistence of selvatic plague in South Africa is regarded as highly dangerous because of its tendency to spread into other territory. In Northern Africa, the plague of the " bled " of Tunis has been regarded, but somewhat doubtfully, as selvatic and due to merions. Further South in that region the *Psammomys roudairei* is predominant, a very susceptible but hitherto unaffected rodent.

Although the sequence, rat–flea–man, is recognized as a necessary one, it is not accepted in its entirety as the only one and the sequence itself may be very long drawn out in time. We have cases presenting themselves in practice of the "epizootic without epidemic" and "epidemic without epizootic." The consideration of these questions leads up to those of interhuman convection and the transmissions of plague by "free fleas." The subject is too lengthy to treat in an abstract, but it may be remarked that the *Pulex irritans* of man, and not the rat flea, may, by reason of its enormous numbers in certain countries such as Morocco, become a plague vector from man to man and that the plague-infected rat flea may itself, by reason of its long life after separation from its host and by its preservation of infectivity for months, become a transmitter of plague.

Dr. Jorge does not seem to show great enthusiasm for vaccination prophylaxis against plague. His hopes of remedy are based mainly on deratization, disinfestation from fleas, rural hygiene, and the march of civilization. Nor is he forgetful of the fact that "plague can efface itself without any intervention." *W. F. Harvey.*

UNION OF SOUTH AFRICA. ANNUAL REPORT OF THE DEPARTMENT OF PUBLIC HEALTH FOR YEAR ENDED 30TH JUNE, 1935 [THORNTON (E. N.), Secretary]. [**Plague** pp. 32–35; **Anti-Plague Measures** pp. 85–89.]

Plague was a matter of great concern in South Africa during the year under review. The mortality among veldt rodents assumed great proportions and there was considerable incidence among human beings. This had not been altogether unexpected, for during 1933–34 the season had been especially "favourable for the growth of grasses on the seeds of which the gerbille depends for its existence." Waves of plague infection began to make their appearance among these rodents and from them was transmitted to human beings by the main intermediary between the gerbille and man—the multimammate mouse. The number of human cases was greatest in the Orange Free State and amounted to 197 with 141 deaths. The outbreaks of plague were of some advantage because it enabled officials to impress upon local authorities with some success the need for immediate antirodent measures. It has always been difficult, when human cases of plague are absent, to arouse the enthusiasm of the smaller local authorities for "active campaigns particularly in connection with the 'building out' of rodents from stores and dwellings."

In another part of this report reference is made to antiplague measures for railways and harbours. It is pointed out that "the *prevention* of infestation rather than disinfestation is aimed at. This can only be accomplished by a continuous patrol of sections and constant inspection of, and repair to, the rodent proofing of structures." The system of patrolled sections can be very readily changed from one of routine antirodent work to work in affected plague areas "Ratproofing, *i.e.*, building the rat out of railway premises, consists of (*a*) making natural harbourages such as guttering, roof-ridging and hollow walls impossible. Access to these places is prevented by wire netting and sheet iron, every corrugation and space being attended to. Floors where solid are made of concrete or asphalt and the outsides of foundations are protected with sheets of corrugated

iron to a depth of two feet to prevent access from outside. . . . (*b*) disinfesting artificial harbourage. Stacks of grain and merchandise are disinfested and turned over at regular periods, old records . . . are being kept elsewhere or tidied and made incapable of harbouring rodents." *W. F. H.*

ROBERTS (J. Isgaer). **The Relationship of the Cotton Crop to Plague, and its Rôle as a Vehicle for Rats and Fleas in East Africa.**—*Jl. Hygiene.* 1935. Aug. Vol. 35. No. 3. pp. 388–403. With 1 graph.

Some authors have expressed the view that there is a close relation between the transport of cotton seed and the introduction of plague infection. It is this question which the author has investigated, both by definite survey and epidemiological investigation, at Mombasa, which is the main port for the East African Coast, and by definite feeding of rats with cotton seed to determine its attractiveness as a food. He has found that " Mombasa is open to infestation with rats and fleas from up-country districts where plague is endemic but only on one occasion has any suspicion been attached to the carriage of infected fleas or rats." Again it is well known in agricultural circles that young animals, such as sheep and calves, when fed on cotton seed develop anaemia, nephritis and gastroenteritis. On historical grounds also " the evidence is strongly against cotton having any association whatsoever with plague. Plague occurred in East Africa long before the introduction of cotton as a crop. The native populations of both Kenya and Uganda were suffering from a high plague mortality before they had commenced cultivating this crop and to-day in Kenya plague is only endemic in areas where no cotton is being grown." The author's conclusions are :—

" (1) Cotton seed is *not* a rat-attracting foodstuff, nor does it provide a desirable food. (2) Cotton seed up to the time of export, and for some time after, is toxic to the majority of *Rattus rattus*, and when fed solely or when rats are forced through hunger to nibble at small quantities, a large proportion of them is killed. (3) Cereals and vegetables, if present, are always eaten in preference to cotton seed. (4) The cotton-seed export from Kenya and Uganda can be regarded as guiltless in the carriage or dissemination of plague infection, either through the agency of fleas or rats." *W. F. H.*

HOPKINS (G. H. E.). **Some Observations on the Bionomics of Fleas in East Africa.**—*Parasitology.* 1935. Oct. Vol. 27. No. 4. pp. 480–488.

The paper describes observations on the duration of life of certain stages of fleas under partially controlled laboratory conditions.

The majority of the author's experiments were performed with fleas of unknown age taken direct from a rat which had been trapped. It may therefore be claimed that the experiments indicate how long a flea might live if it moved away from a dead host under natural conditions. The author exposed his insects to three combinations of temperature and humidity, and records the length of life (males and females separately) of *Xenopsylla cheopis* and *brasiliensis*. The data in these and other experiments are fully recorded, the mean length of life and its standard error, also the maximum and minimum, being shown in tables. The author observed that under the conditions of his experiment female fleas laid a small number of eggs, nearly all of them on the first day of the experiment. Eggs and the larvae and pupae which

came from them were subjected to controlled conditions. It appears that neither *X. cheopis* nor *brasiliensis* could be successfully bred through at either 15° or 30°C. At 20°C., in air approaching saturation, it was found that the duration of the larval and pupal stages combined was about 45 days for females and a little longer for males of both species of *Xenopsylla.*

A short series of experiments was also carried out with unfed, recently hatched fleas, the duration of life of which at 20°C. was studied. It is clear that the duration of life was materially longer than that recorded under very similar conditions by LEESON [this *Bulletin*, 1932, Vol. 29, p. 839]. No reason was found to explain this discrepancy which is considerable. *P. A. Buxton.*

ROBERTS (J. Isgaer). The Endemicity of Plague in East Africa.—*East African Med. Jl.* 1935. Oct. Vol. 11. No. 7. pp. 200–219.

WILLIAMS (C. L.). **History of Bubonic Plague in New Orleans.**—*Amer. Jl. Trop. Med.* 1935. Sept. Vol. 15. No. 5. pp. 555–569.

A clear-cut history of plague as it has affected and been eradicated from a sea-port town carries an instructive lesson. Plague did not appear in New Orleans until the facts of its mode of transmission and its mode of suppression were already known. Its history is all comprised within a period of 13 years from the time that the first plague rat was trapped in 1912 to 1925 when the last known plague-infected rat was found.

An active search was made throughout the city for two years after the appearance of the first rat case and not till then did the first human case come to light. Now began " the first human and rodent outbreak," which as a conjunction of epizootic and epidemic came to an end in 1915, and came to an end, so far as infected rats were concerned, in 1917. What is called the " second human and rodent outbreak " occurred in 1919 with its last human case in 1920 and its last infected rat in 1921. A last, purely " rodent infection," originated with the arrival of a ship in the port and the development of a human case on board. Plague on this occasion made its appearance among the dock rats, but no human cases occurred. The last infected rat was found in January 1925 and " to-day there is no doubt that New Orleans is free from plague infection." This is a brief account of the plague history of New Orleans.

The measures taken for suppression of and protection against plague are, naturally, even more interesting than the epidemiology. Three procedures fall to be noticed, described as (1) reduction in the number of rats, (2) separation of rats and human beings, and (3) elimination of foci of infection. Reduction was effected by trapping and poisoning, while separation was accomplished by rat proofing, that is to say by the construction of buildings " so that rats had no places in them in which to harbor and escape from their many enemies. Essentially, there were three methods : one was to elevate the buildings, leaving a clear, open space beneath ; the second was to build an impervious wall around the ground floor, penetrating two feet into the ground . . . and extending above the floor level so as to close all openings into the space between the walls ; the third, and most effective procedure, was to lay the ground floor in concrete with a protective wall around the edges, sinking two feet into the ground." An idea of the cost of these operations is given by the statement that during the 3 years of the first outbreak more or

less extensive alterations to more than 150,000 buildings involved a cost to the owners of more than 5,250,000 dollars.

Elimination of foci was accomplished by subjecting the area surrounding a point where an infected rat had been found to intensive trapping, fumigation and, in a few special cases, demolition.

Protection against spread of infection to other localities was also attended to. At first freight cars and freight were very carefully inspected, but this was given up as unnecessary. All ships, however, leaving New Orleans "were fumigated to kill rats before departure" and at the present time rat proofing and thorough inspection are applied to ships with most gratifying results. "Today between 80 and 90 per cent. of the ships that visit United States ports are entirely free from rats and the heavily and persistently-infested vessel has become a rarity."

It is hoped and believed that the city of New Orleans will now continue to be free from further plague infection. *W. F. H.*

PARDAL (Eduardo). Brote de peste pulmonar en Santa Rosa (provincia de San Luis). [**Outbreak of Pneumonic Plague in Santa Rosa (San Luis).**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1935. Mar. Vol. 6. No. 5. pp. 643–650. With 1 map.

URIARTE (Leopoldo), ARGERICH (Ricardo) & PASSALACQUA (Ricardo). Una epidemia de neumopeste en 1913. [**An Outbreak of Pneumonic Plague in 1913.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1935. Mar. Vol. 6. No. 5. pp. 651–660. With 1 map. French summary.

BATTAGLIA (Manuel I.) & URIARTE (Leopoldo). Un brote de neumopeste en Merou (prov. Entre Rios) en 1927. [**An Outbreak of Pneumonic Plague in Merou (Entre Rios).**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1935. Mar. Vol. 6. No. 5. pp. 661–667. With 1 map. French summary.

All three of these communications illustrate the extreme infectivity and the high fatality rate of pneumonic plague. In the first case the history is of a man who probably developed secondary plague pneumonia and who infected some five contacts. These were a hospital attendant, a hospital cook, his nephew, a dweller in a farm opposite the hospital, and, indirectly, one who had been in contact with the last of these cases.

The second account is of an epidemic, unrecognized at first and diagnosed as influenza or simple pneumonia, which gave rise to 45 deaths in 3 villages; probably all who were attacked died, although some of them were treated by serum. The infection was very strictly limited to a few families and ceased with the segregation of all contacts.

In the third outbreak also there was a high fatality rate. Twenty-three cases of pneumonic plague were all fatal in spite of sero-therapy, and the foci of infection were again limited to members of a family and their attendants. *W. F. H.*

URIARTE (L.) & CANAL FEIJÓO (E. J.). La neumopeste en algunos puntos de la prov. de Santiago del Estero. [**Pneumonic Plague in Santiago del Estero.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1935. July. Vol. 7. No. 1. pp. 42–52. With 1 map & 6 figs. French summary.

A description is given of the occurrence of 11 cases of pneumonic plague in the Argentine province of Santiago del Estero. The first

case was that of a woman who lived in one of those huts called "ranchos," which are commonly constructed for peasants living in the fields. The other members of the family were infected from this case as also were the members of another family who had given help to the first family. All the patients died. The outbreak is an example of the restriction of pneumonic plague to circumscribed foci.

W. F. H.

i. URIARTE (Leopoldo), MORALES VILLAZON (N.) & ANCHEZAR (Benjamin). Procedimiento para investigar la peste en roedores. [**Examination for Plague in Rodents.**]—*Folia Biol.* Buenos Aires. 1935. July–Aug.–Sept.–Oct. Nos. 52–53–54–55. pp. 229–230. [French version p. 244.]

ii. DE LA BARRERA (J. M.) & RIESEL (M.). Epizootia de peste en roedores en La Pampa y Río Negro. [**An Epizootic of Plague in the Territories of the Pampas and Rio Negro.**]—*Ibid.* pp. 230–233.

iii. SAVINO (Enrique). Peste rural en el Departamento de Leventué (La Pampa). [**Rural Plague in Leventué (the Pampas).**]—*Ibid.* pp. 233–235.

iv. DE LA BARRERA (J. M.). Peste en liebre (*Lepus europaeus*, Pallas). [**Plague in the Hare.**]—*Ibid.* p. 243.

i. The examination of the bone marrow of animals for plague bacilli is strongly recommended, especially if putrefaction has set in. In this way pure cultures can be obtained in hot climates even if the animal material has been 3 or 4 days in transit to the laboratory. It is convenient to despatch the tibia of the animal or, if this is too small, the femur.

ii. The authors give an account of a plague epizootic among guinea-pigs (*Microcavia* and *Galea*), the occurrence of one human case in a child and transmission from guineapig to guineapig by its fleas.

iii. An outbreak of plague is described which was characterized by the occurrence of four human cases in places very far from one another and during an interval of 70 days. No rats of the species *Rattus* and no *X. cheopis* fleas were found. The cause of the plague was apparently traceable to an epizootic among rats of the species *Graomys griseoflavus*, an animal of arboreal habit and almost ubiquitous. The flea index of these animals was 6, and 92 per cent. belonged to the species *Rhopalopsyllus occidentalis*, while the remaining 8 per cent. were *Craneopsylla wolffhuegeli*. A plague infection was also demonstrable in guineapigs of the genus *Galea*.

iv. This account is one of isolated infection of a hare, and is placed on record as not being a common type of animal infection. Such an infection may be of some importance in view of the fact that the hare is not a burrowing animal and can cover considerable distances. Its flesh is used for food and its pelt for sombreros. *W. F. H.*

URIARTE (Leopoldo) & MORALES VILLAZÓN (N.). A propósito de peste en roedores agrestes de la Argentina. [**Plague and the Rodents of the Country in Argentina.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1935. Nov. Vol. 7. No. 2. pp. 185–212. With 2 coloured plates & 1 map. English summary.

In the Argentine rodents of the cavy type are numerous. These rodents have suffered from plague epizootics on several occasions, but

only one of these seems to have persisted (see above) in the territory of the Pampas. The species of rodent found infected were the cavies or "cuises," *Microcavia australis* and *Galea*, together with a cricetid *Graomys griseoflavus*, the last of which has been experimentally shown to be very susceptible to plague. Cavies, which are rural in distribution, must have been infected through the rat and once infected become a real danger to man, because of their abundance and the absence of any obstacle to the widespread distribution of an epizootic. Fortunately there is a scarcity of population in the districts affected, scarcely one inhabitant in 10 square kilometres, and only 20 cases of human plague have been registered in 16 years over an area of 30,000 square kilometres. *W. F. H.*

SAVINO (Enrique). Peste rural en el departamento de Leventué, territorio de La Pampa. [**Rural Plague in Leventué (the Pampas).**] —*Rev. Inst. Bacteriológ.* Buenos Aires. 1935. July. Vol. 7. No. 1. pp. 141–150. With 8 figs.

The subject of this article has been noted above. The peculiarity of the epizootic was that although widespread over an area of 180 by 70 kilometres there was little or no human plague, a fact ascribed to the arboreal habit of the rat concerned (*Graomys griseoflavus*), which is very different from the domestic character of *Rattus rattus*.

W. F. H.

KELLOGG (W. H.). **Rodent Plague in California.**—*Jl. Amer. Med. Assoc.* 1935. Sept. 14. Vol. 105. No. 11. pp. 856–859.

After a period of quiescence and persistence of moderate enzootic plague [this *Bulletin*, 1934, Vol. 31, p. 878] there has developed in some of the counties of California a well marked ground-squirrel epizootic. It serves, unfortunately, to demonstrate "that the ground squirrel infection not only is not decreasing after thirty years but is, on the contrary, increasing and expanding over a much wider territory. Not only in the Coast Range and the interior valleys but now in the Sierras it is found. The establishment of a permanent endemic rodent focus is thus thoroughly demonstrated." An important point in connexion with the present epizootic is the apparently "increasing pulmonary tendency on the part of the prevailing strain of organism." One of the most characteristic differences between rat and squirrel plague is the presence of nodules and haemorrhages in the lungs in the latter and not in the former. Such pulmonary tendency in the ground squirrel may, it is feared, have relation to the occurrence of the pneumonic form of plague in man. *W. F. H.*

MEDEDEELINGEN VAN DEN DIENST DER VOLKSGEZONDHEID IN NEDERLANDSCH-INDIË. 1935. Vol. 24. Supp. to No. 3. pp. 185–348. With 22 graphs, 7 sketch maps & 4 maps. English summary pp. 269–271.—Verslag betreffende de pestbestrijding op Java over het jaar 1933. [**Report on Antiplague Measures for 1933 in Java.**]

The year 1933 saw the outbreak of a severe epidemic of plague in Java. Not only was it severe, but the population of West Java, in which it

occurred, was difficult to deal with and the time was one of great financial stringency. A total mortality of 6,442 in 1932 became increased to 16,881 in 1933 and was distributed as follows :—15,188 in West Java, 1,684 in Central Java, and 8 in East Java. The large mortalities of the epidemics of 1914 (15,156) and 1925 (14,484) were located almost entirely in East Java and East and Central Java respectively. Thus, in the present epidemic visitation, there was no return to the former territory of East Java, and this is ascribed to the good results of the earlier preventive work in that region. The basis of the preventive work has been housing improvement and constant inspection to maintain that improvement. Vaccination, as an antiplague measure, did not take a prominent place in 1933. This was founded upon the opinions expressed by OTTEN on the vaccines of Haffkine and Kolle in 1921–1922, when he obtained unsatisfactory results—a reduction of the mortality only to one half (35,000 vaccinated alternating with 35,000 controls). The report under review, however, refers to 1933 and OTTEN has since then brought forward a vaccine (see below) which he considers sufficiently active to allow of recommendation for mass inoculation. It is a living vaccine with a single dose of 500 million organisms of the avirulent strain Tjiwidej, and is claimed (April 1935) to be capable of reducing plague mortality to 10 per cent.

The reference in this report to the unusual obstinacy of the people of West Java is illustrated by the reception given to the plague staff in their endeavour to establish the diagnosis of plague. A spleen puncture of corpses has been found to be a very certain means to this end, but the population was ignorant and intensely Mohammedan. A spleen puncture was looked on in some districts as a violation of the dead and in others, more animistic, as causative of pain to the soul of the dead. The opposition reached a considerable height and one of the staff was murdered by villagers.

The epidemic was combated in accordance with the general plague policy by a gradual improvement in housing conditions. "The disease disappeared as if by magic from the infected subdistricts as soon as the improvement of housing conditions was taken in hand." *W. F. H.*

DE VOGEL (W.). Vaccinations antipesteuses avec un virus vivant aux Indes Néerlandaises. [**Anti-Plague Vaccination with Living Organisms in the Netherlands Indies.**]—*Bull. Office Internat. d'Hyg. Publique.* 1935. Aug. Vol. 27. No. 8. pp. 1542–1545.

In this short communication there are illustrated two important methods of procedure : (1) test of efficacy by alternate case data and (2) the use of living instead of dead organisms for protective inoculation. OTTEN had found an avirulent culture of the plague bacillus with which he could strongly immunize such very sensitive animals as *Mus rattus griseiventer* and the guineapig. The "smooth" variant was alone used as antigen. After obtaining satisfactory results with these animals he inoculated himself with a dose of this living plague corresponding to 1–50th agar culture. Then followed inoculation of 50 Javanese volunteers. Now the vaccination has been extended to the population of whole districts near Bandoeng in Java where plague was raging. Half only of the individuals of each family, divided up so as to be as far as possible comparable in the matter of age, were vaccinated. The actual numbers vaccinated between 2nd November and

6th December were 37,500, which was about half the population of the districts attacked. Deaths occurring among either vaccinated or non-vaccinated in the first week after the vaccination were not included in the mortality results. These are given as from the second week after vaccination for a period of 2 months and amounted to 23 (14·5 per cent.) in the vaccinated and 132 (85·4 per cent.) in the non-vaccinated. Each death in the region under test was investigated and microscopic examination made of the material obtained by lung and spleen puncture. Up to the present 400,000 persons have been vaccinated with living plague without incident or accident. When the recurrence of plague among the vaccinated shows that immunity is at an end they will require to be re-vaccinated. *W. F. H.*

OTTEN (L.). Pest-vaccinatie op Java. [**Plague Vaccination in Java.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1935. Oct. 29. Vol. 75. No. 22. pp. 1850–1864.

[Otten seldom loses the opportunity—and with very good reason still—of commenting on the unsatisfactory nature of plague statistics. His remarks apply to many other vaccination statistics.] The commonest fault is that vaccination is applied on a voluntary basis and the mortality among the willing is compared with that among the unwilling. Now it is only too common that, both in social status and in religious belief, these groups are entirely different and that these circumstances involve wholly different modes of life. Again vaccination may be slowly adopted and be completed only by the end of an epidemic. Such an epidemic, at the height of its virulence, claims its victims from an essentially non-vaccinated population, and so the figures of mortality become steadily more favourable to the vaccinated, who make their appearance in the population as the epidemic is declining. This favourable effect is enhanced if the epidemic is localized and the vaccinated are chiefly resident in the unaffected region. Probably no statistical data take account of, what is so elusive in the case of plague, its course in time and place, while a satisfactory control group is practically always wanting. The remedy is patent. Only vaccination according to an alternate case method can afford the necessary data; this involves separation of the test population into two nearly equal groups; that division should extend not only to modes of living but to the smallest unit of society—the family. Even this should be split up equally as far as possible according to sex and age. Nor does Otten merely preach an academic doctrine. He has applied it himself with satisfying and convincing effect. His new vaccine, or as it might be called his renewal of an old method of vaccination, consists of a living, avirulent organism. Such a method was employed by HAFFKINE for cholera and STRONG for plague. The vaccine too, like that which has always been used for smallpox, is a living vaccine.

The plague strain "Tjiwidej" accidentally discovered, is so avirulent that both rat and guineapig can stand a whole culture. This is not such a very isolated phenomenon and it is possible to isolate avirulent variants from other plague strains.

The investigations which have been carried out with strain "Tjiwidej" show that it is protective in very small doses to those extremely susceptible animals, the house rat and the guineapig.

Whereas with a dead vaccine in the case of the rat, even after 3 injections, not more than 30 per cent. survive, there is a survival of some 85 per cent. when inoculated with a *single* dose of the living vaccine. In the case of man injections of 1/50 and 1/25 agar culture resulted in quite a slight and rapidly disappearing reaction. The temperature was raised merely some tenths of a degree. After extended animal trials and trials on volunteers the vaccine was made available for large scale operations and these were carried out on an alternate case basis. A total of 37,435 persons in two subdistricts were inoculated, the adults with 1/10, the children with 1/25 agar culture, and 44,757 were not inoculated. The respective mortalities were 38 and 213, or 1·01 per thousand as against 4·75. The duration of immunity is a matter of great importance, but there seems little evidence that this extends to more than the usual 6 to 8 months. Finally Otten reminds us that vaccination is but a temporary expedient. Improvement of the dwelling so as to cut off man, who is but a side-link in the plague chain, from the rat-flea sequence of events is the true solution of the plague problem. *W. F. H.*

GIRARD (G.). Résultats de la campagne de vaccination antipesteuse, par germes vivants, effectuée à Madagascar (8 octobre 1934–10 mai 1935). [**Results of Plague Vaccination with Living Germs in Madagascar.**]—*Ann. de Méd. et de Pharm. Colon.* 1935. Oct.–Nov.–Dec. Vol. 33. No. 4. pp. 898–919.

A communication on the subject of plague vaccination with living germs in Madagascar has already been noticed [this *Bulletin*, 1934, Vol. 31, p. 885]. At that time the use of the avirulent plague strain "E.V." had seemingly justified itself. The present trial is the sequel to the previous one and has been of a very elaborate nature. Actually a special census of the district operated on was made and great precautions taken that all the vaccinated and unvaccinated should be so recorded as to be capable of identification. Not only were the deaths from presumed plague recorded but also the total deaths from all causes. Measures were taken by means of smears and animal inoculation to certify, as far as possible, the deaths actually due to plague. The vaccine was transported rapidly to the place of use in large thermos receptacles holding 5 litres and the temperature to which it was exposed was not allowed to exceed 5°C. Only one dose was given, which varied with age :—1cc., containing 1,500 million germs, to all individuals over 15 years ; 0·7 cc. from 7 to 15 years : and 0·5 cc. from 2 to 7 years. Infants under 2 years were not vaccinated. In the course of the trial it was found that young children showed little reaction and the dose for those over 7 years of age was raised to 1 cc. The population of the district, on examination, amounted to 107,000. Of these 5,300 children of less than 2 years were excluded, so that vaccination operations were conducted on 102,000 persons with 46,879 vaccinated and 55,121 unvaccinated controls. As a round number the controls are estimated at 60,000. Deaths from plague among the vaccinated amounted to 22 or 0·47 per cent. and from all causes to 225 or 4·8 per cent. The corresponding numbers for the unvaccinated controls were 100 deaths (1·66 per cent.) and 581 deaths (9·7 per cent.). Many details of deaths are given and a special section deals with the subject, "want of success and its lessons." The actual results

obtained are, however, sufficiently striking to lead the author to affirm that "the new mode of vaccination can be officially recommended in Madagascar." *W. F. H.*

SOKHEY (S. S.) & MAURICE (H.). Sur une méthode biologique de standardisation des vaccins antipesteux et sur le pouvoir de protection relatif de quelques vaccins antipesteux mesuré par cette méthode. [**A Biological Method of Standardization of Plague Vaccines and its Use for Comparison of Vaccines.**]—*Bull. Office Internat. d'Hyg. Publique.* 1935. Aug. Vol. 27. No. 8. pp. 1534–1541.

This is a brief summary of a method of standardization which is to be published later in detail. It consists in determining what is the smallest quantity of a plague vaccine which will immunize white mice against a given standardized testing dose. This method definitely eliminates the so-called toxic deaths among the test animals during protective vaccination. The animal used is the laboratory mouse, over 3 months in age and weighing 23 to 28 gm. Cultures for vaccine purposes are obtained originally by sowing venous blood from cases of grave human septicaemia on agar slopes. In order to test the virulence of vaccine cultures a dose of 0·5 cc. containing 6 to 12 bacilli (1 in 10 million dilution) is injected into at least 5 animals and the strain used should kill 4 out of the 5 in 5 to 10 days in order to be reckoned as virulent. No diminution of virulence has been found of these virulent cultures on rabbit blood agar even after long preservation, if kept on ice (4°–8°C.). A dose of 0·5 cc., containing 60 to 120 organisms, is used as infective testing dose 7 days after the administration of the last protective dose. Four or five graduated doses of the vaccine under test are used and 5 mice are injected with each of the doses in two equal portions at an interval of 7 days. These animals are kept under observation for 25 days after receiving the infecting dose. All animals which die and all that survive are examined for plague. A control series of 5 or 10 non-vaccinated mice accompanies each experiment. "The smallest dose of vaccine which saves 3 animals out of 5 is considered as the protecting dose. . . . Experiments should be made in duplicate." As a result of trials Haffkine's vaccine was found protective in a dose of 0·001 cc., Lister Institute vaccine in a dose of 0·008 cc. and Paris vaccine in a dose of between 0·008 and 0·015 cc. Other vaccines were also tested. *W. F. H.*

TIKHOMIROVA (M.). **The Rôle of the Jerboa,** *Dipus sagitta* **Pallas, in the Epidemiology of Plague.**—*Rev. Microbiol., Epidémiol. et Parasit.* 1935. Vol. 14. No. 1. [In Russian pp. 61–63. English summary pp. 63–64.]

Spontaneous plague epizootics have been observed among jerboas, *Dipus sagitta* Pall., in the sandy steppes of the Volga-Ural. These have been accompanied by epizootics among *Pallasiomys* (=*Meriones*) *meribianus* Pall. Whole families of jerboas have succumbed to plague. From the experiments he has carried out with minimal doses of *Past. pestis* intraperitoneally the author concludes that the rodent, which succumbed with acute plague in 1–2 days, is a very sensitive test animal and may be used instead of the guineapig. *W. F. H.*

KUZNETSOV (N. J.) [Edited by]. **Campaign against Rodents in the Cis-Caucasian Steppes. Symposium of Reports on Work of 1932–1934.**—232 pp. With 55 figs. 1935. Rostov-on-Don: (Publ. by the Azov-Black Sea Regional Executive Committee.) [In Russian.]

This symposium is devoted to the results of a two-years' campaign against murines and susliks throughout an area of several million hectares in the steppes adjoining the Azov and Black Seas and in Northern Caucasus. In addition to the methods of combating these rodents, the reports deal with the ecology and biology of these animals. The first part of the symposium, being devoted to mice, is mainly of agricultural and domestic interest. The second part deals with the susliks (*Citellus pygmaeus*) the important rôle of which in the epidemiology of plague is well known.

N. J. KUZNETSOV describes the organization and results of the campaign in 1933–34. The work was carried out by the local population mobilized in hundreds, and divided into companies of about 300 each under the direction of an instructor. In dealing with a given area the workers moved in two rows, those in the first carrying bottles with chlorpicrin and cotton wool swabs, which were dipped into the poison and introduced into each suslik burrow encountered, while each worker in the second row carried a spade for covering up the treated burrow with earth. The amount of chlorpicrin introduced into each burrow was 2 gm., since previous tests proved that this dose had a lethal effect upon susliks at a minimum temperature of 6°C. As the result of this campaign over 116 million burrows were treated over a total area of 3 million hectares, the density of the suslik population being reduced to an average of 0·3 per hectare. In the author's opinion this thinning will effectively prevent the recurrence of epizootics among the rodents, while by repeated treatment of the same areas it may be possible to destroy the entire suslik population.

O. N. BOCHARNIKOV and K. T. KRYLOVA discuss the relative merits of various methods and apparatus for treating suslik burrows with chlorpicrin, hydrogen sulphide and diphosgene. P. N. STUPNITSKY describes experiments on the application of bacteriological methods for the destruction of susliks, using *Bac. typhi spermophilorum*, Mereschkowsky and Danysz's bacillus. The pathogenicity of these organisms for "clean" susliks was confirmed, but attempts to transmit the infection to large numbers of captive susliks failed. The third part of the symposium is devoted to the ecology and biology of the steppe-inhabiting rodents. *C. A. Hoare.*

TIKHOMIROVA (M.), SAGORSKAJA (M.) & ILJIN (B.). Die Nager und ihre Flöhe im Steppen, -Uebergangs-Landstrich der Nowo-Kasansker und Slomichinsker Rayons und ihre Rolle in der Epidemiologie der Pest. —*Rev. Microbiol., Epidémiol. et Parasit.* 1935. Vol. 14. No. 3. [In Russian pp.231–253. With 3 figs. [34 refs.] German summary pp. 253–254.]

SIMOND (P. L.) Comment fut mis en évidence le rôle de la puce dans la transmission de la peste.—*Rev. d'Hyg. et de Méd. Préventive.* 1936. Jan. Vol. 58. No. 1. pp. 5–17.

CALBAIRAC (M.) & SEYBERLICH. Au sujet de l'incubation de la peste bubonique. [**The Incubation of Bubonic Plague.**]—*Bull. Soc. Path. Exot.* 1935. July 10. Vol. 28. No. 7. pp. 677–678.

The authors draw attention to the fact that, according to international sanitary convention, the maximum incubation period of plague is 6 days. Three quarantine cases have come under their notice which, owing to the strictness of the supervision exercised and the record of temperatures thrice daily, may be regarded as giving exact incubation intervals. These were 9, 7 and 10 days respectively.

W. F. H.

ICAZA (Jorge Illingworth). Observación de peste bubónica en el Hospital General de Guayaquil. [**A Case of Bubonic Plague in the General Hospital at Guayaquil.**]—*Bol. Oficina Sanitaria Panamericana.* 1935. Sept. Vol. 14. No. 9. pp. 821–824.

The interest of this case lay firstly in the negative results obtained by gland puncture, the appearance in some of the blood cultures of a pneumococcus and the final establishment, after several inoculations of guineapigs, of *Pasteurella pestis* as the cause of the condition. In the second place it was found difficult, with no indication of any local rat epizootic or of any human cases of plague, to account for the occurrence of the disease. The patient was a labourer engaged in emptying freight railway wagons from the interior. It was concluded, on the evidence, that he had contracted plague through a chance infection by means of a flea which had been transported in railway baggage.

W. F. H.

YENIKOMSHIAN (H. A.). **A Case of Septicaemic Plague simulating Pernicious Malaria.**—*Indian Med. Gaz.* 1935. Sept. Vol. 70. No. 9. pp. 508–509.

A case of plague in a female child of 12 years is here described in which the main symptom was coma. In view of the fact that she came from a malarial district, had had malaria, and had a large hard spleen, the most natural diagnosis was a pernicious malaria of cerebral type. A blood culture made during life, puncture of the spleen after death, and animal tests all showed that this was a case of septicaemic plague.

W. F. H.

MONTAGNE (M.) & RIVOALEN (A.). Un cas de méningite pesteuse. [**A Case of Plague Meningitis.**]—*Bull. Soc. Path. Exot.* 1936. Jan. 8. Vol. 29. No. 1. pp. 21–23.

Records of plague meningitis are rare. The case was one of a child of 8 years whose sister had died suddenly after 2 days illness. There had been an axillary bubo, which disappeared after 3 injections of anti-plague serum. Nervous symptoms, however, persisted—rigidity of the neck with Kernig's sign and violent occipital headache. These became aggravated, with the onset of delirium, incessant movement of the hands and of the eye-balls, and spasms of masseters and left sterno-mastoid. Lumbar puncture and blood culture gave negative results. A second lumbar puncture gave an opalescent fluid and the culture of

this furnished definitely the plague bacillus, but this positive diagnosis was only forthcoming two days after the death of the patient.

W. F. H.

URIARTE (Leopoldo), MORALES VILLAZÓN (N.) & ANCHEZAR (Benjamin). Un procedimiento para investigación de la peste en los roedores. [**Examination of Rodents for Plague.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1935. July. Vol. 7. No. 1. pp. 5–15. With 1 fig. English summary.

Small rodents often arrive at a laboratory in a state of decomposition and it has been an important advance to demonstrate with certainty the presence of the plague bacillus under these circumstances. The procedure developed by the authors is the same as that of PONS in Saigon. Cultures from the bone marrow will furnish pure plague growths even after putrefaction has set in. Marrow is obtained from the diaphysis of the upper end of the tibia or from the femur and is used on tubes of agar and broth, which are incubated at 18°C. The results obtained were excellent. *W. F. H.*

URIARTE (Leopoldo) & MORALES VILLAZÓN (N.). Acerca de la diferenciación del bacilo pestoso. [**Differentiation of the Plague Bacillus.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1935. Nov. Vol. 7. No. 2. pp. 287–296. English summary.

Ordinarily it is an easy matter to identify the plague bacillus. The authors advise, however, if there is any difficulty in distinguishing the plague bacillus from other pasteurellas and especially from *P. pseudotuberculosis rodentium*, adding to the carbohydrate tests those of adonite and rhamnose. *W. F. H.*

URIARTE (Leopoldo) & MORALES VILLAZÓN (N.). Un cocobacilo similipestoso en las ratas de Buenos Aires. [**A Plague-like Coccobacillus in Buenos Aires Rats.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1935. July. No. 7. No. 1. pp. 91–98. With 2 figs. on 1 plate. English summary.

A pasteurella organism has been found in Buenos Aires rats which, although it is non-pathogenic to the rat, is very pathogenic if injected into guineapigs and rabbits. This small bipolar coccobacillus may easily be mistaken for plague. It is Gram-negative, indole-positive, non-haemolytic, blackens lead paper, produces neither coagulation nor change of colour in litmus milk and ferments glucose and saccharose but not rhamnose. *W. F. H.*

GIRARD (G.). Présence d'un bactériophage antipesteux chez la *Xenopsylla cheopis* au cours d'une petite épidémie de peste à Tananarive. [**Plague Bacteriophage in the Flea.**]—*C. R. Soc. Biol.* 1935. Vol. 120. No. 31. pp. 333–334.

After having established, in the usual way, the presence of phage in the faeces of rats from a quarter of Antananarivo where human cases of plague had appeared, a further trial was made of the *X. cheopis* fleas captured on rats of the same quarter. Five experiments were done with 63, 28, 17, 13 and 45 *X. cheopis*, which were ground up, placed in a

bouillon flask at 37°C. and filtered through an L3 candle after 24 hours. A phage was found in the case of the batch of 63 fleas, which was as active as that obtained from rat faeces. The other batches proved phage-negative or little active. As a control 73 and 10 *cheopis* fleas were taken from a quarter of the town with no rat plague and these gave negative results. The existence of a phage in the flea implies that it came from the rat and the fact may have epidemiological importance.

W. F. H.

JOUKOW-WEREJNIKOW (N.) & FAWORISSOWA (B.). **Studies on the Nature and Significance of Bacteriophage Phenomena. III. Action of Bacteriophage in vivo on Plague Bacilli.**—*Rev. Microbiol., Epidémiol. et Parasit.* 1935. Vol. 14. No. 3. [In Russian pp. 119–204. [28 refs.] English summary p. 205.]

"It was found that experimental guineapigs being injected both with a bacteriophage and large doses of plague culture succumbed simultaneously with control animals. In organs of the dead animals a large number of *B. pestis* was found microscopically. No culture, however, has been recovered till the 5th passage. But guineapigs infected with organs of the dead animals have invariably succumbed. Therefore cases may be when the bacteriophage and the bacilli can live in an organism without a marked reciprocal action. This phenomenon may be explained by the properties of colloids of the organism which prevent this action, as the authors have shown that the normal serum in vitro impedes a lytical action of the bacteriophage upon the plague bacilli."

ALAYON (Fernando). Bacteriofagoterapia na peste. (Estado atual da questão.)—*Ann. Paulist. Med. e Cirurg.* 1935. Dec. Vol. 30. No. 6. pp. 569–572. [15 refs.]

DANZEL (L. A.). La "rati-scille," scille rouge raticide.—*Ann. d'Hyg. Pub., Indust. et Sociale.* 1935. Dec. Vol. 13. No. 12. pp. 677–701. With 2 figs. (1 map). [18 refs.]

CHOLERA.

RUSSELL (A. J. H.). Recherches sur le choléra dans l'Inde. [**Cholera Research in India.**]—*Bull. Office Internat. d'Hyg. Publique.* 1936. Jan. Vol. 28. No. 1. pp. 58–63.

Active research in cholera is going on at present in India, and will be published in detail in due course. Some indications of the lines of this research and interesting details are given in this publication. The whole population of an endemic zone comprising 10,000 people is under investigation during epidemic and inter-epidemic periods. Altogether 50,000 stool examinations have been made. In the investigation of numerous agglutinable and inagglutinable vibrio strains by chemical and serological methods it was found that the agglutinable vibrios of healthy persons could not be differentiated by the ordinary biochemical and serological methods from the typical cholera vibrio, but that these same two groups are capable of being separated by their chemical structure.

Some of the epidemiological observations on the test endemic population are noteworthy and the investigation, which includes a complete epidemiological history of each individual, has now run for more than a year. Of the 140 cases of cholera which have occurred, 10 per cent. were so slight that they would ordinarily have passed unnoticed. Carriers numbered 3·5 per cent. in the general population, but this figure rose to 9·1 per cent. for recent contacts. The mean duration of carriage was about 30 days. Most of the cases of cholera seemed to have arisen from previous cases and only in 4 was there a strong presumption that the source was a carrier.

Much evidence points to the necessity of intensive study of the non-agglutinable vibrios. In Calcutta during the inter-epidemic period most of the cases of cholera give only non-agglutinable vibrios, whilst the agglutinable vibrio is predominant at the peak of an epidemic. These observations, conducted over 5 inter-epidemic periods, support the contention that non-agglutinable vibrios can give rise to cholera.

Bacteriophage treatment research has been instituted in the hospitals of Calcutta with controls and applies so far to 1,200 cases. Mortality from cholera with ordinary treatment, compared with that of patients receiving cholera phage in addition gave percentages of 18 and 13 respectively. If the reservation were made that the vibrio isolated must be agglutinable, these percentages become 20 and 8 respectively, a result still more favourable to the employment of phage treatment.

One final point of interest is contained in the statement that the cholera toxin is not an endotoxin but an exotoxin with an extremely small molecule and easily destroyed. *W. F. Harvey.*

SCHÖBL (Otto) & NUKADA (Minoru). Versuche ueber Fische als Choleraträger. [**Fish as Cholera Carriers.**]—*Kitasato Arch. Experim. Med.* 1935. Oct. Vol. 12. No. 4. pp. 313–323.

Fish form part of the daily diet in Japan and may be eaten raw. Any suggestion therefore that fish may, under certain circumstances, be carriers of the cholera vibrio is a matter of grave concern to public health authorities. The trials here undertaken were of the nature of feeding experiments and determination of the length of stay of cholera

vibrios in the gastro-intestinal tract. Infected food was given to carp by means of a stomach sound. Faeces were examined by removing the test material with the fish out of water. Cholera vibrios could be found in the intestine up to the sixth day, which is just about the length of time food remains in the body. They could be isolated in pure culture most easily from the stomach where the reaction is alkaline. On one occasion the vibrio was isolated from the faeces on the 17th day and on one occasion from the gall bladder. On the experimental findings the author concludes that fish are not to be regarded merely as mechanical agents but as potentially real carriers of the cholera vibrio. *W. F. H.*

KUBOTA (Kazuo). Epidemiological Observation of Cholera in Formosa.—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa).* 1935. Nov. Vol. 34. No. 11 (368). [In Japanese pp. 1791–1841. With 13 charts. [58 refs.] English summary pp. 1841–1843.]

RICE (E. M.). A Preliminary Epidemiological Study of Cholera with Special Reference to Assam and Suggestions for Further Investigations.—*Indian Jl. Med. Res.* 1935. Oct. Vol. 23. No. 2. pp. 467–473. With 1 graph.

LAHIRI (S. C.). **A Preliminary Report on the Study of Coagulation Time of Blood in Cholera Cases.**—*Jl. Indian Med. Assoc.* 1935. Dec. Vol. 5. No. 3. pp. 89–99. With 6 figs.

The method used to determine coagulation time was to fill a capillary tube with finger blood and to break off the end of the tube every 15 seconds until a fibrin thread made its appearance. Normally coagulation time by this method, which was carried out at room temperature, was found to be 3 to 5 minutes. Altogether 116 cases of cholera were studied and it was found that there was shortening of the coagulation time in most cases. This alteration in time shifted towards normal with the improvement of the patient. Although the coagulation time of the blood roughly followed the same course as the specific gravity it was independent of it and was indeed a more reliable index of the general condition of the patient. *W. F. H.*

SODA (Y.) & collaborators. Sur le délai dans lequel les selles doivent être examinées pour la recherche du vibrion cholérique. [**Admissible Delay in Examination of Stools for Cholera.**]—*Bull. Office Internat. d'Hyg. Publique.* 1936. Jan. Vol. 28. No. 1. pp. 64–66.

These experiments on the survival of cholera vibrios were carried out with the stools of cholera patients and with artificial stool mixtures. The conclusions arrived at are that :—(1) at least 5 gm. faecal matter are required in an examination for carriers ; (2) this faecal matter should have been obtained in the 24 hours preceding examination ; and (3) it should have been kept at a low temperature. Moreover, it is necessary under the conditions of quarantine in ports that the medical officer on board ships should sow the stools in peptone water, or that a small quantity of faeces, taken within 24 hours of arrival, should have added to them 10 cc. of peptone water at about pH 8·4 and be kept at a low temperature. *W. F. H.*

SEAL (S. C.). **Difficulties in the Bacteriological Diagnosis of Cholera Vibrios.**—*Indian Med. Gaz.* 1935. Nov. Vol. 70. No. 11. pp. 614–620. With 10 figs. on 2 plates. [18 refs.]

Workers who are faced with the constant difficulties of identification of the cholera vibrio or, in other words, the separation of the true cholera vibrio from the cholera-like vibrio will find in this publication a very useful account of the cholera variants which present themselves in practice. They are considered under the headings—morphological, cultural, biochemical and serological characters ; animal experiments and "phage" lysability. Some excellent plates accompany the text descriptions. No specific conclusion, as might have been expected, is reached. "The position as regards the so-called atypical forms of cholera vibrios is still unsettled. In a disease that is considered to be water-borne, the problem of the extracorporeal existence of cholera vibrios, *e.g.*, in water, is as important as that of human carriers. . . . Inagglutinable vibrios will probably in future have to be included in the aetiological factors of cholera." *W. F. H.*

WHITE (P. Bruce). **The Relation of Specific Carbohydrates to Roughening in *V. cholerae*.**—*Jl. Path. & Bact.* 1935. Nov. Vol. 41. No. 3. pp. 567–568.

The author considers that his long work on the nature of roughening justifies him in maintaining that this phenomenon represents the reduction or loss of specific smooth carbohydrate, and the appearance of a second, rough carbohydrate, which had remained masked in the "S" vibrio. An opposing view is that the second carbohydrate is *not* preexistent but a positive transformation peculiar to roughness.

W. F. H.

WHITE (P. Bruce). **The Q Proteins and Non-Specific O-Antigens of the Cholera Vibrio.**—*Jl. Hygiene.* 1935. Dec. Vol. 35. No. 4. pp. 498–503.

The object of this note was to investigate the characters of the Q cholera proteins and incidentally to show that they were identical with, or an important constituent of, the non-specific O-antigen of GARDNER and VENKATRAMAN [this *Bulletin*, 1935, Vol. 32, p. 769). Another identity which seems probable is that of the total Q fraction with the "acid-soluble A substance" of LINTON and his co-workers. These Q proteins are alcohol-soluble antigens, capable of fractionation into 2 parts Q_1 and Q_2 : the former is obtained by "treatment of the total Q fraction with alkalised water" and the latter by precipitation "from an aqueous suspension of the residue with HCl." Their importance in relation to the specificity of vibrios may be summarized in the author's own words :—

"Vibrios heated at 100°C. in saline suspension agglutinate in a generalised manner and often to a high titre with the antisera of the Q proteins of the cholera vibrio. The antibodies concerned are not inactivated by the carbohydrate fraction of *V. cholerae*. Occasional strains of vibrio react similarly in the living state with these Q (cholera) agglutinins. The antiserum of the Q_2 substance of S *V. cholerae* seems to possess agglutinating properties additional to those of anti-Q_1 and anti-Q_2 R sera, rather more specific and possibly related to "carbohydrate" receptors. There is reason to believe that the Q proteins are true constituents of the living

vibrio and are not serological artefacts due to reagents and heat. It seems that these substances and their antibodies are important contributors to the "non-specific O agglutination" of vibrios recently discussed by Gardner and Venkatraman." *W. F. H.*

DOORENBOS (W.). Sur la présence d'hémolysines dans les jeunes cultures du vibrion cholérique. [**Haemolytic Power in Young Cholera Cultures.**]—*C. R. Soc. Biol.* 1936. Vol. 121. No. 2. pp. 128–129.

Twelve strains of cholera vibrio, obtained from fatal cases of cholera and showing typical morphological and biological characters, were tested for their haemolytic power after 8 hours' and 24 hours' growth. Of the 8-hour growths 4 possessed strong, 5 a feeble and 3 no haemolytic power while none of the 24-hour growths showed any haemolytic power at all. *W. F. H.*

TAYLOR (J.) & AHUJA (M. L.). **Serological Variations in Vibrios from Non-cholera Sources.**—*Indian Jl. Med. Res.* 1935. Oct. Vol. 23. No. 2. pp. 531–544.

In continuation of their previous work on the development of the serological characters of *V. cholerae* by an inagglutinable vibrio the authors have experimented with three strains of vibrio having no relation to the cholera vibrio. These strains were, (*a*) *V. metchnikovi*, (*b*) an inagglutinable water vibrio, and (*c*) an inagglutinable vibrio from a healthy individual in an endemic cholera area. By intraperitoneal passage in mice and the preparation of cultures from the heart blood of these animals two types of colony began to emerge in all three strains. One colony was somewhat opaque and the other translucent. It was found that while the opaque colony corresponded to the original type strain, the translucent colony gave the typical biochemical and serological reactions of *V. cholerae*. In one respect, however, a difference was found separating these strains from the cholera vibrio. "The chemical structure of the three strains and also of their variants, as determined by their protein and carbohydrate fractions, differed from that found in the case of the agglutinable vibrios isolated from cholera cases in India." Thus there has been brought about a laboratory transformation in essential particulars of a non-cholera to a cholera vibrio. *W. F. H.*

LINTON (Richard W.), MITRA (B. N.) & MULLICK (D. N.). **Respiration and Glycolysis of the Cholera and Cholera-like Vibrios.**—*Indian Jl. Med. Res.* 1936. Jan. Vol. 23. No. 3. pp. 589–599.

Even when serological and haemolytic tests fail to differentiate cholera from cholera-like vibrios, there remain other tests, and particularly chemical analysis, which may effect a separation. Metabolic activities, as is shown in this article, may assist in the differentiation by taking account of respiratory and glycolytic activity. In this method suspensions of 18-hour growths were prepared in Ringer's solution, containing 0·1 per cent. glucose only for the respiration experiments and 0·1 per cent. glucose plus 0·1 per cent. $NaHCO_3$ for the glycolysis experiments. "Respiration is given in c.mm. of oxygen consumed per mg. of bacteria, and glycolysis in c.mm. CO_2 given off per mg. of bacteria."

The work " has shown that metabolism is most active in the group of vibrios isolated from cases of cholera and belonging to group I. In the members of group II the metabolic activity is less than in the first group and in group III is even less, although these two groups overlap in respect to respiration. The El Tor group IV is sharply marked off from the others by the fact that while its respiration is equal to that of group I, its aerobic glycolysis is negative." In this way for other groups differences are established on the basis of metabolism. In general a correlation has been found to exist between metabolism, chemical structure and source of the strains for groups I to VI.

Changes from agglutinability to inagglutinability are always accompanied by a lowering of metabolic activity as is also the change from smoothness into roughness. *W. F. H.*

DOORENBOS (W.). Sur la variation du pouvoir hémolytique du vibrion El Tor. [**Variation of the Haemolytic Power of the El Tor Vibrio.**]—*C. R. Soc. Biol.* 1936. Vol. 121. No. 2. pp. 130–132.

Just as in the case of cholera vibrios young 8-hour growths of El Tor vibrios proved more haemolytic than the 24-hour growth and one strain actually gave no haemolysis in 24-hour growth. This non-haemolytic strain was an interesting one. It was isolated from a case of diarrhoea with agglutinable vibrios in the stools. Among 40 agglutinable colonies on an agar plate sown from the stool of this patient there were found three which were non-haemolytic. On examination these three strains proved to be partially haemolytic after only 6 to 8 hours' cultivation, that is to say they behaved like the cholera vibrio.

It seems probable then that there are strains between the classical strongly haemolytic El Tor vibrio and the non-haemolytic cholera vibrio which must be placed in an intermediate haemolytic category.

W. F. H.

SCHOLTENS (R. T.). Analyse des récepteurs du vibrion cholérique et du vibrion El Tor.—*Ann. Inst. Pasteur.* 1936. Jan. Vol. 56. No. 1. pp. 68–75. [See also this *Bulletin*, 1934, Vol. 31, p. 312 ; 1935, Vol. 32, p. 771.]

MITRA (B. N.). Racemization of the Proteins of *Vibrio cholerae* and Related Organisms. Part I. The Diamino Acids. Part II. The Monoamino Acids.—*Indian Jl. Med. Res.* 1936. Jan. Vol. 23. No. 3. pp. 573–578. [17 refs.] ; 579–588. [11 refs.]

LINTON (Richard W.), MITRA (B. N.) & SEAL (S. C.). Further Notes on the Cholera and Cholera-like Vibrios.—*Indian Jl. Med. Res.* 1936. Jan. Vol. 23. No. 3. pp. 601–607.

BANERJEE (Dhirendra Nath). **Is Cholera Kidney a Form of Nephrosis ?**—*Jl. Indian Med. Assoc.* 1936. Jan. Vol. 5. No. 4. pp. 160–161.

In some respects the pathological, biochemical and clinical features of cholera may show certain characters in common with nephrosis, as

defined by VOLHARD and FAHR. If these be set aside and only the differential characters emphasized, it is found that, whereas in nephrosis there are no changes in the glomeruli, its course is chronic, oedema is early and constant, no retention of nitrogenous waste products occurs and there is no uraemia, the reverse is the case in cholera. Thus the cholera kidney is not to be regarded as representing a nephrosis. *W. F. H.*

TAYLOR (J.), AHUJA (M. L.) & GURKIRPAL SINGH. **Experimental Observations on Cholera Vaccine.**—*Indian Jl. Med. Res.* 1936. Jan. Vol. 23. No. 3. pp. 609–617.

Actual protection experiments are the best test of the efficacy of a vaccine. The infection test in this case was an intraperitoneal injection in guineapigs of a smooth agglutinable heterogeneous strain of *V. cholerae*. It is ordinarily " accepted that cholera vaccine should not be used more than six months after the date of manufacture." The importance of these trials, which show the possibility of a much longer period of preservation, is obvious. Another point of great importance investigated has a bearing on quarantine regulations and on the shortest time within which a sufficiently high degree of immunity is developed in the vaccinated individual. The authors find (1) Cholera vaccine preserves full immunizing potency up to two years even when exposed to high hot-weather temperatures; (2) Immunity does not seem to be effectively developed, after inoculation, before the 5th or 6th day and is still higher by the 8th to 10th day; (3) Maximum protection is obtainable with strains of the characteristic prevailing serological type obtained from actual cases of cholera and showing H and O agglutination to a typical cholera vibrio serum, in this case the " original " Japanese type serum. In contrast with this it was found that " agglutinable strains from carriers and agglutinable variants from strains of origin other than cholera cases give a lower degree of protection." *W. F. H.*

SUGINO (Kouhei). **The Antigenic Properties of the Cholera Vaccine prepared by the Philippine Bureau of Science.**—*Philippine Jl. Sci.* 1935. Oct. Vol. 58. No. 2. pp. 153–161.

The organism which is used in the Philippines for prophylactic vaccination against cholera was isolated several years ago from a fatal case of cholera and is known as strain No. 22. Its antigenic character has not been tested and this forms the subject of the present enquiry. The organism was non-motile, possessed a typical comma-like appearance, produced a pellicle on peptone water after several transplantations, gave the cholera red reaction and fermented glucose, maltose, and saccharose, but not mannite.

Immunological efficiency was tested by animal protection tests. Guineapigs were immunized by intraperitoneal inoculation and were then tested by intraperitoneal injection of lethal doses of a number of cholera strains. Protection was afforded against these strains. It may be concluded from these experiments that the cholera vibrio (strain 22), which is unique in its inability to ferment mannite and in its non-motility, " protects effectively against various strains of cholera vibrio." *W. F. H.*

KAPUR (N. C.). **A Plea for the Use of Concentrated Saline in Cholera.** [Correspondence.]—*Indian Med. Gaz.* 1935. Aug. Vol. 70. No. 8. pp. 479–480.

The suggestion, put forward in previous correspondence [this *Bulletin*, 1935, Vol. 32, p. 764], that the efficacy of treatment of cholera by hypertonic salt solution lay more in the action of the salt than the supply of fluid, is here combated and the opinion advanced that " the administration of fluid plays almost as important a rôle as that of salts and alkalies." This restatement of the original doctrine is based on the extensive experience at the Campbell Hospital, Calcutta. *W. F. H.*

BANERJEE (Dhirendra Nath) & DATTA (Sunil Krishna). **Sodium Lactate in the Prevention and Treatment of Cholera Acidosis.**—*Jl. Indian Med. Assoc.* 1936. Jan. Vol. 5. No. 4. pp. 168–169.

The bicarbonate-carbonic acid ratio is considerably altered in cholera. Factors which favour the development of acidosis are the dehydration of the tissues, the excessive loss of base in the frequent stools and the effect of toxin in the production of excess acid. Treatment designed to restore the bicarbonate-carbonic acid ratio, consists in administration of fluid to overcome dehydration and stimulate diuresis and the use of alkali, usually sodium bicarbonate, in large doses. Some distinct disadvantages accompany the use of large doses of sodium bicarbonate intravenously and the author has replaced it successfully with sodium lactate in a dose of 10 cc. of the molar solution per kilogram of body weight. The lactate ion is transformed to glucose and the sodium ion liberated combines with the excess of carbonic acid to form a rapid supply of bicarbonates. In this way acidosis is overcome without any precipitation of an alkalosis. *W. F. H.*

VENOMS AND ANTIVENENES.

MARTIN DEL CAMPO (Raphael). Nota acerca de la distribución geográfica de los reptiles ponzoñosos en Mexico. [**The Geographical Distribution of Poisonous Reptilia in Mexico.**]—*An. Inst. Biol.* Mexico. 1935. Vol. 6. Nos. 3 & 4. pp. 291–300. [46 refs.] English summary.

Forty-six species of reptiles were investigated in Mexico as regards their geographical distribution. Fourteen species of coral snakes, the Micrurus genus of Elapinae, occur generally in the country ; a marine snake, *Pelamydrus platurus*, all along the Mexican Pacific southward from the Gulf of California ; three species of Ancistrodon (Crotalinae), *A. bilineatus*, locally known as " cantil " and " freno " along most of the Pacific coast, and two others, *A. piscivorus* (water viper) and *A. contortrix* (copper-head) on the northern frontier ; Sistrurus is represented by two species, *S. caternatus edwardsii* in the north, at Sonora, Tamaulipas and perhaps Durango, and *S. ravus*, in wooded districts and the warm and humid lowlands, and eastern slopes of the Central Plateau. Sixteen species of rattlesnake, Crotalus, occur in various parts of Mexico, some in hot dry lands, others in hot moist districts. Eight species of Bothrops are found in the moist, hot, wooded regions of the east and south-east. Finally, two species of Heloderma or poisonous lizard, *H. horridum*, and *H. suspectum* (" Gila monster "), are known, the former being met with in the west and south and the latter chiefly in the south-east, but may be seen almost anywhere along the Pacific slope. *H. H. S.*

PEPEU (F.). Studi sull'ofidismo nelle Colonie Italiane. [**Snakes in the Italian Colonies.**]—*Terapia.* 1935. Dec. Vol. 25. No. 198. pp. 353–363. With 12 figs. (9 on 4 plates). [20 refs.]

The following snakes are met with fairly frequently and are consequently of practical importance for production of suitable antivenene for treatment, particularly important now that military operations are being undertaken :—

VIPERIDAE : In Libia : *Cerastes cerastes* ; *C. vipera* and *Echis carinatus*.
In Eritrea : *E. carinatus, Bitis arietans, Atractaspis irregularis, A. magrettii.*
In Somalia : *E. carinatus, B. arietans, A. engdahli, A. leucomelas* and *A. microlepidota.*

COLUBRIDAE : *Naia haie* in all three, and *N. nigricollis* in Eritrea and Somalia.

Some idea of the relative frequency of the chief snakes may be obtained from the captures made during 4½ months in Tessenei (south of Kassala near the border between Eritrea and the Anglo-Egyptian Sudan) : *Echis carinatus* 513, *Naia nigricollis* 11, *Naia haie* 10, *Bitis arietans* 4, *Atractaspis magrettii* 1. *H. H. S.*

GITHENS (Thomas S.). **Studies on the Venoms of North American Pit Vipers.**—*Jl. Immunology.* 1935. Aug. Vol. 29. No. 2. pp. 165–173.

Twenty-six species of snakes were studied, the following points being specially investigated : (1) The amount of venom obtained by

extraction ; (2) The toxicity of the several venoms ; (3) The relative danger to man. The total number was made up of 21 species of rattlesnake (Crotalus), three of Moccasin (Ancistrodon) and two Sistrurus.

As regards the first point, the amounts obtained varied considerably, the average being 0·1–0·3 cc. or 30–100 mgm. of dried venom. *Crotalus adamanteus* and *C. atrox* would give an average yield of 0·5 cc. or more, whereas small species such as *C. lepidus, C. tigris, Sistrurus catenatus* and *S. miliarius* (pigmy rattlesnake) yielded less than one-tenth as much. Moreover, there were wide differences within the same species, some after several weeks in captivity producing little or no venom, while others after hibernating may give amounts far above the average. Averages of large numbers only have, therefore, real value. Speaking generally, the amount secreted varied directly with the size of the species.

As regards toxicity ; all the venoms are complex and contain poisons acting on the blood, the vessel walls, the central nervous system and other tissues. The toxicity of the venom varied within a narrow range in each species as a rule, but closely related species might show wide differences. The more primitive, from the evolution aspect, the more toxic to the nerve centres is the venom. Those secreting a small amount have usually the more active venom, so that the number of fatal doses contained in an average extracted amount is more nearly constant than the toxic dose in mgm. of the dried product. Reliable data in respect of the relative danger to man are not easy to obtain, for the species of snake biting is often undetermined, half the reports merely stating " bite by a rattlesnake." In general, the larger the snake the more dangerous to man ; the notable exception to this was *Crotalus cerastes* the death rate from which was higher than its size and the toxicity of its venom would lead one to expect. *H. H. S.*

VON KLOBUSITZKY (D.). Biochemische Studien ueber die Gifte der Schlangengattung Bothrops. I. Mitteilung : Die blutgerinnungsfördernde Wirkung und die Reinigung des Giftdrüsensekretes der *Bothrops jararaca.* [**Biochemical Studies of the Venom of the Ophidian Genus** *Bothrops.*]—*Arch. f. Experim. Path. u. Pharm.* 1935. Sept. 11. Vol. 179. No. 2. pp. 204–216. [25 refs.]

The paper begins with references to previous work on the coagulating action of snake venom. Some authors have ascribed this to a property inherent in the toxic substance ; others state that it is quite distinct from the toxin ; again, some state that the same snake-venom sometimes causes haemolysis, at other times coagulation of the blood. The object of the author's work was to clear up these differences of opinion. He used the venom of the snake *Bothrops* (*Lachesis*) *jararaca* in the fresh state, in a solution of the dried venom, and as toxin, free from all proteid matter. The coagulative action was tested on human blood, and on oxalated blood of the horse. It was found that fresh venom produces haemolysis in a strength of 5·5 per cent. ; it inhibited coagulation in strengths of 0·02 to 0·01 per cent. ; and caused coagulation in the strength of 0·005 per cent. and under. So also, when the dried venom was tested, it was found that the action depended upon the degree of concentration. With a strength of 0·4 per cent. coagulation occurred ; with higher strengths, haemolysis

followed. The author describes the method used to prepare proteid-free toxin: he calls this substance "Bothropotoxin,"; with it he found that, at low degrees (*e.g.*, 0·1 per cent.) of concentration, coagulation occurred; in high degrees of concentration (above 1 per cent., and up to 10 per cent.) coagulation was prevented. In contrast with the results obtained with fresh venom or simple solutions of dried venom, the purified toxin never caused haemolysis. It was thought possible that the coagulating effect was not a property of bothropotoxin, but of some ferment attached to the venom; experiments were therefore made to ascertain whether two principles, toxic and coagulative, could be separated by electrophoresis, ultrafiltration, and heat. None of these methods succeeded, and the author could only establish the fact that there is a well-marked parallelism between the toxic and the coagulative action of bothropotoxin; if one property is destroyed, the other is destroyed too. In order to investigate the mechanism of the coagulating action, experiments were made with defibrinated blood, with washed blood-corpuscles, and with fibringlobulin solution. It was found that bothropotoxin only causes coagulation when the blood contains fibrinogen, prothrombin, and thrombokinase; that is, it can only take the place of calcium.

Composition of *Bothrops* venom. The venom contains 9·7 per cent. of nitrogen: albumens and globulins are precipitated by heat: no albumose was found, but peptones are present. 5·2 per cent. of the venom can be extracted with petrolether; the extract contains two substances, one of which, brown in colour, is soluble in alcohol and water, but is insoluble in benzol or chloroform. The other constituent, yellow in colour, is soluble in chloroform. Neither of these substances possesses toxic or coagulative properties: the author proposes to deal with their chemical composition in a future paper.

Conclusions.—It is only in low degrees of concentration (0·005 per cent. in the case of fresh venom, 0·4 per cent. in that of solutions of dried venom) that coagulation of oxalated blood occurs; moderate strengths (0·02–0·01 per cent.) prevent coagulation, and cause haemolysis. It was not found possible to separate the toxic and coagulative principles of the venom. Bothropotoxin differs from the whole venom in possessing no haemolytic action. *H. J. Walton.*

VON KLOBUSITZKY (Dionysio). Estudos biochimicos sobre os venenos das serpentes do genero *Bothrops*. I. Acção coagulante e purificação da secreção da glandula venenosa da *Bothrops jararaca*. [**Biochemical Studies on Bothrops Venom. I. Clotting Action and Purification of the Venom of** *B. jararaca*.]—*Mem. Inst. Butantan.* 1935. Vol. 9. pp. 259–273. With 1 fig. [25 refs.] English summary.

[This appears to be largely a repetition of the work reported in the foregoing.]

The venom of *Bothrops jararaca* was found to bring about coagulation only when present to the extent of 0·005 per cent. or less; in higher concentrations, 0·02–0·01 per cent., it leaves the blood unchanged as regards clotting, in still higher concentrations it causes haemolysis. A dried extract, yellowish-green in colour, was obtained and named bothropotoxin, which formed foaming colloidal solutions on addition of water or 50 per cent. alcohol. It contained 9·7 per cent. nitrogen of which 8·97 were coagulable proteins and 0·73 other nitrogenous bodies,

chiefly proteins; no albumoses were found. By Soxhlet's method 5·29 per cent. ethereal extract was obtained, with a brown coloured substance, soluble in water or alcohol, and separable in a crystalline form when acted upon by concentrated NaOH. There was 4·4 per cent. non-volatile mineral substances, 0·18 per cent. chlorine. Unsuccessful attempts were made to separate the toxic and coagulant constituents. The coagulating action is believed to result from interaction of two factors, perhaps more, "one of which manifests itself in the substitution of calcium and the other in the destabilization of fibrinogen." The haemolysing, or at least anticoagulant effect of the higher concentrations of the toxin may be due to some impurity or third factor present. *H. H. S.*

CHOPRA (R. N.) & ROY (A. C.). **Some Observations on the Haemolysis caused by Snake Venoms. (A Preliminary Note.)**—*Indian Med. Gaz.* 1936. Jan. Vol. 71. No. 1. pp. 21–23.

The authors have been studying certain biochemical characteristics of snake venoms, notably those of the Indian cobra and the Daboia (Russell's viper), in an attempt to associate pharmacological properties with certain constituents. In the present paper they record an investigation into the haemolytic properties of these venoms on different species of animals. Their technique was as follows:—

"The blood was drawn under strictly aseptic conditions in sterile citrated saline solution and washed several times with normal saline solution, aseptically, and a one-per-cent. suspension of the red corpuscles in normal saline was prepared. After the addition of the venom solutions (0·01 per cent. in normal saline) the tubes were put in the incubator at 37°C. for 2 hours and then in the ice-chest overnight and readings were again taken after 21 hours."

Cobra venom haemolysed rapidly, the viper venom caused no haemolysis in 2 hours but in 21 hours the haemolysed red cells formed a coloured zone with clear supernatant fluid. If the venoms were previously passed through a Seitz filter no haemolysis occurred with either. Had the haemolytic element been eliminated by the filtration or merely inactivated? Ordinarily, these venoms will not haemolyse sheep's cells, but will do so if lecithin is present; after passage through the Seitz filter the venom had no haemolytic power even in the presence of lecithin. Their proteolytic action—dissolving fibrin, liquefying gelatin—and the power of clotting milk were not affected by filtration. In general, filtration removed the haemolytic action of cobra venom and of the Daboia venom; it was found, however, that the respiratory effect of cobra venom was little impaired, though the effect in this respect on Russell's viper venom was marked. *H. H. S.*

GRASSET (E.) & ZOUTENDYK (A.). **A Comparative Investigation into the Antigenic Properties of Detoxicated Indian and African Venoms and the Cross Action exerted by the Respective Antivenenes.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1935. Jan. 25. Vol. 28. No. 4. pp. 391–398.

The authors have shown that strong solutions of African snake venoms may be rendered atoxic although retaining their antigenic properties and giving rise to potent antivenenes [see this *Bulletin*, 1934, Vol. 31, p. 103]. Having obtained some desiccated venom of *V.*

russelli and *Naia tripudians* from Kasauli, they undertook a series of interesting and important investigations.

1. *Comparison of Indian with African venoms.*—It must be understood that no general conclusions as regards the relative toxicities of these could be drawn, for, as is well known, the lethal dose of venoms varies according to time of year, feeding, moulting, etc.; the authors can only state their findings with the actual samples with which they worked. They found that the venoms of *Naia tripudians* and *Naia flava* (Cape cobra) were of nearly equal potency, 0·5 mgm. of the former and 0·4 mgm. of the latter, intravenously administered, killing a rabbit in 1½–2 hours. Daboia (Russell's viper) venom is much stronger than that of *Bitis arietans* (puff adder) or *Causus rhombeatus* (night adder); 0·2 mgm. of the Daboia venom killed a rabbit in a few minutes, whereas 1·0 mgm. of Bitis venom killed in 2 hours, and 10 mgm. of Causus in 18–24 hours.

2. *Whether concentrated solutions of Indian venoms could be detoxicated* like African venoms, by incubating at 37°C. in presence of formalin. For African (Cape cobra) venom broth had been found essential, so these were similarly treated. When formalin is added to Cobra venom a heavy precipitate forms, but this seems merely to enhance the antigenic value (*cf.* alum, tapioca, etc., added to diphtheria toxin). Both the Indian venoms were rendered practically atoxic by the above method, rabbits being able to withstand the equivalent of 200 m.l.d. of Daboia venom and more than 100 of Indian cobra venom, after the venom had been kept for 3 weeks at 37°C. with 1 per cent. formalin.

3. *The antigenic properties of detoxicated Indian snake venoms.*—Though these were considerable, the results with Indian cobra anavenene were much lower than with the Cape cobra product. But rabbits immunized with Cape cobra venom withstood more than 6 fatal doses of the Indian cobra venom, administered intravenously.

4. *Tests of the cross efficacy of Indian and African antivenenes.*—It was found that the Indian serum had but a weak neutralizing effect on African viperine venoms; 2·0 cc. would not neutralize even one fatal dose of Bitis venom. It was further remarked that while the Indian antivenene had a moderate effect against Cape cobra venom and that of other African colubrines, the neutralizing effect of African antivenene on the venom of *Naia tripudians* was considerably greater than on that of the Cape cobra venom from which it was produced.

As regards *V. russelli* and *Bitis arietans*, their antivenenes have no appreciable neutralizing effect on the heterologous venom.

H. H. S.

GRASSET (E.), ZOUTENDYK (A.) & SCHAAFSMA (A.). **Studies on the Toxic and Antigenic Properties of Southern African Snake Venoms with Special Reference to the Polyvalency of South African Antivenene.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1935. Apr. 17. Vol. 28. No. 6. pp. 601–612.

This article contains much information and is full of interest, but does not permit readily of abstraction. The authors describe the venoms of five South African colubridae—*Naia flava* (Cape cobra), *N. nigricollis* (M'fesi), *N. haie* (Egyptian cobra), *Dendraspis angusticeps* (Mamba, green or black) and *Sepedon haemachates* (Ringhal's spitting cobra)—and five Viperidae—*Bitis arietans* (Puff adder), *B. gabonica* (Gaboon viper occasionally found in South Africa, but actually a Central

and West African species), *B. caudalis* (Horned adder), *B. atropos* (Berg adder) and *Causus rhombeatus* (Night adder). They also state the average yield of venom of each and their relative toxicities in animals such as the mongoose (*Herpestes pulverilentus*), Meercat (*Suricata tetradactyla*), Black-spotted Genet (*Genetta tigrina*), American grey squirrel (*Sciurus carolinensis*) and in frogs and scorpions.

Discussing the toxic and antigenic properties of the chief of these venoms, they conclude that for general use in South Africa where the inhabitants are sparsely distributed antivenenes to the two commonest —the Cape cobra and the Puff adder—are most needed. Preparation of such antisera has been greatly facilitated by using detoxicated concentrated solutions and anavenenes obtained by action of formalin for immunization of horses. This is done by injecting the mixed antigen over a period of 7 weeks. From experiments in rabbits it was found that 1 cc. of the concentrated serum will neutralize, after an hour's contact, 2 mgm. Cape cobra venom, the same of *N. nigricollis* and *N. haie*, 2·2 mgm. of *Dendraspis* and 1·75 of *Sepedon*, 9·0 of *Bitis arietans*, 11·0 of *B. caudalis* and more than 25·0 mgm. of *Causus rhombeatus*. Strange to say it is ineffectual against the Gaboon adder venom, although it is classed Bitis ; clearly its venom is antigenically basally different from that of the Puff adder (*Bitis arietans*). Although it is rarely met with, the venom from this snake might usefully be incorporated, if this could be done without injuring the neutralizing properties of the other two. *H. H. S.*

CÉSARI (E.) & BOQUET (Paul). Recherches sur les antigènes des venins et les anticorps des sérums antivenimeux. Deuxième mémoire. Venin de *Cerastes cornutus* et sérums antivipérins (*C. cornutus*). [**On the Venom and Antivenene of** *Cerastes cornutus*.]—*Ann. Inst. Pasteur.* 1936. Feb. Vol. 56. No. 2. pp. 171–185.

In a former article the authors reported the results of a similar investigation on *Vipera aspis*. In the present they deal not only with the venom and antivenene of *C. cornutus* but also with the action of *aspis* venom with *Cerastes* antivenene and *vice versa*.

Speaking first of the venom of *C. cornutus*, the authors estimated its toxicity *in vivo* on rabbits, guineapigs and mice. Intravenous injection of 0·5 mgm. killed rabbits in 1–2 minutes, 0·45 mgm. had no effect estimable clinically. Subcutaneously, at least 5 mgm. were needed to kill and that in 10–12 hours. The results in guineapigs were more variable ; 0·5 mgm. intravenously killed in less than 2 minutes, 0·4 and 0·3 mgm. in ½ to 3 hours, smaller doses might not prove fatal at all, but on the other hand, 0·1 or even 0·05 mgm. might kill in 12 minutes or so, other animals might show paralysis of the hind limbs with dyspnoea and then recover, or die suddenly. Subcutaneously, at least 6 mgm. were necessary to cause death, more, that is, than in the case of the rabbit. In mice, death occurred in 1–2 minutes after intravenous injection of 0·04–0·1 mgm. ; many withstand 0·02 mgm. and with the larger dose some survive for ½ hour. Subcutaneously, 0·3 mgm. will kill in about 12 hours ; higher doses such as 1·0 mgm. do not shorten the period.

The authors next estimated the coagulating power *in vitro*, and found that 0·0025 mgm. produce clotting of 2 cc. horse plasma in 15 minutes. Horse plasma was found more sensitive to *Cerastes* venom than that of cattle or sheep (the opposite was observed with *V. aspis* venom).

Above 60°C. the coagulant action is lessened and at 80°C. abolished. The haemolytic effect was determined, and 0·00035 mgm. was needed to haemolyse 1 cc. of horse's red cells, a little more than had been found in the case of *V. aspis* venom. Sheep cells appeared to be refractory.

Antitoxin potency was estimated in the rabbit only. (1) The *Cerastes* antivenene neutralized from 2,000–5,000 units. (2) *V. aspis* antivenene had a titre of 9,500 against the homologous venom, but only 200 against *Cerastes cornutus* venom. (3) *Cerastes* antivenene with a titre of 5,000 against its homologous venom, had one of 570 against *V. aspis* venom.

The anticoagulant, antihaemolytic, precipitating and flocculating properties were also investigated, and it is noteworthy that with regard to the last flocculation appeared more often in mixtures of *aspis* venom and *Cerastes* antivenene than with homologous sera.

The authors' findings may be summarized thus :—The antitoxic potency of *Cerastes* antivenenes is not very closely parallel with their protective properties against coagulation and haemolysis, nor with the reactions of precipitation or flocculation. In the present state of knowledge only *in vivo* tests enable one to judge of the potency of antiviperine sera. *Cerastes* antivenene completely neutralizes the homologous venene, but only to a small degree counteracts the effects of the coagulant in *V. aspis* venom, and *vice versa*. *H. H. S.*

ZANETTIN (Giuseppe). Osservazioni sulle lesioni oculari determinate dal veleno della "Naja nigricollis" in Eritrea. [**Ocular Effects resulting from the Poison of** *Naja nigricollis* **in Eritrea.**]—*Arch. Ital. Sci. Med. Colon.* 1935. Dec. Vol. 16. No. 12. pp. 856–858.

One of the results of *Naja nigricollis* ejecting its venom into the eyes is said to be blindness, but from the two cases here recorded this would seem to be unusual. The first case was a man of 35 years who, turning over stones, unexpectedly came across a *Naja nigricollis*, which from a distance of 40 cm. spat poison into his eyes. He was promptly given Calmette's antivenene and sent to hospital. There was much pain and photophobia ; the conjunctiva was strikingly pale especially that of the lower lid and fornix. The next day there was a little discharge, but no further symptoms developed and there was no constitutional disturbance. The second case was similar, except that no antivenene was given ; recovery, however, was equally rapid, 3 days.

The poison would thus appear to have a proteolytic acid leading to a local necrosis of the conjunctiva. Seeing that general symptoms, usually severe in bites by this snake, were absent, either very little poison reached the eye or else absorption is practically nil. *H. H. S.*

KELLAWAY (C. H.) & WILLIAMS (F. Eleanor). **Antigenic Differences between the Venoms of the Tiger Snake** *Notechis scutatis* **and the Black Tiger Snake** *Notechis scutatis* **var.** *niger.*—*Australian Jl. Experim. Biol. & Med. Sci.* 1935. Mar. 16. Vol. 13. Pt. 1. pp. 17–21.

The venom of the *niger* variety of tiger snake, *Notechis scutatus*, is less toxic than that of the banded tiger snake itself but is a more powerful coagulant, both *in vitro* and *in vivo*. Further study of their antigenic differences has been made possible by the preparation of fractions of

these venoms. Univalent antivenene was prepared by injection of the venom of the typical banded form, and this was mixed with varying doses of the venoms and fractions ; the mixtures after standing for an hour at room temperature were then injected into guineapigs. One cc. of the antivenene was found to neutralize approximately 0·4 mgm. of tiger snake venom, 0·2 mgm. of the corresponding thrombin-free fraction, and 0·29 mgm. and 0·15 mgm. respectively of the venom and thrombin-free fraction of the black variety of snake. In terms of lethal dose per 100 gm. of guineapig, 1 cc. antivenene neutralized about 200 doses of tiger snake venom, 103 of the thrombin-free fraction, and 49 and 26 respectively of the black tiger snake venom. A second sample neutralized 163 lethal doses of tiger snake venom, 40 of black tiger snake venom, 17 of copperhead venom, 13 of the venom of brown snake, 3 of cobra and 1·6 of death adder venom. Marked cross protection had been found between the venoms of tiger snake and copperhead in guineapigs, and these animals actively immune to two lethal doses of death adder venom resisted 8 l.d. of copperhead and 10 of tiger snake venoms.

The authors then tested the neutralizing power of sera of rabbits immunized with thrombin-free fractions of the venoms, and found that they gave a higher proportional protection against this fraction and against black tiger snake venom than does antivenene prepared against the entire venom, while similarly sera of rabbits immunized with the thrombin-free fraction of the black variety snake venom give greater protection against whole tiger snake venom and its fraction. The thrombin-free fractions are antigenically different. The venom of the black variety is less toxic than that of the type, when subcutaneously injected, but this does not depend on its more potent thrombin.

H. H. S.

WATANABE (Osamu). **Basic Substance in the Formosan Snake Venoms.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1935. Dec. Vol. 34. No. 12 (369). [In Japanese pp. 2083–2087. With 3 figs. on 1 plate. [10 refs.] English summary pp. 2087–2088.]

" 1. In various kinds of Formosan snake venoms there may be found a substance that forms a nearly insoluble crystalline salt with flavianic acid. The formation of the crystals takes place even in a few drops of a very diluted solution of the venom, say for instance a 1 : 1,000 solution of the dried venom ; it can be seen under the microscope shortly after the reagent, a 10 per cent. aqueous solution of flavianic acid, is added. A similar reaction follows upon the addition of picric acid, but this reagent is not suitable for the microscopical demonstration of the base, because the primary precipitate appears in the form of a nearly amorphous powder.

" 2. The base is especially abundant in the venoms of the Taiwan-Habu (*Trimeresurus mucrosquamatus* Cantor) and the Ao-Habu (*Trimeresurus gramineus stejnegeri* Schmidt), and is contained in an appreciable proportion in the venom of the Kusari-hebi (*Vipera russellii formosensis* Maki), whereas the venoms of the Hyappo da (*Agkistrodon acutus* Günther) and the Okinawa-Habu (*Trimeresurus flavoviridis flavoviridis* Hallowell) contain little of it.

" In contrast to these Crotalid and Viperid venoms the Elapine venoms, at least those of the Taiwan-Cobra (*Naja naja atra* Cantor)

and of the Amagasa-hebi (*Bungarus multicinctus* Blyth) seem not to contain this basic substance.

"Whether or not these crystal-forming bases contained in the various venoms are all or in part identical cannot be decided at present. Likewise it remains yet uncertain, whether they are toxic or not, or toxic in the same degree. In any case it seems to be a very interesting problem from the standpoint of comparative chemistry to ascertain their presence or absence in as many kinds of snake venom as possible, and to study the chemical and physiological properties of the isolated bases. This may prove of interest also to the zoologist and the toxicologist.

"3. 0.5 g. of the dried venom of the Taiwan-Habu yielded 0·19 g. of the picrate. In its atomic composition the base corresponds to $C_5H_{14}N_2$, and in some of its properties it resembles cadaverin, but is, in the author's opinion, different from the latter substance. Although its physiological effects are yet unknown, it is not likely to be of a highly toxic nature."

SHORTT (H. E.) & MALLICK (S. M. K.). **Detoxication of Snake Venom by the Photodynamic Action of Methylene Blue.**—*Indian Jl. Med. Res.* 1935. Jan. Vol. 22. No. 3. pp. 529–536.

In this investigation the authors used venom of *Daboia* (*V. russelli*) and as experimental animals pigeons of 290–310 gm. weight. The minimum lethal dose having been ascertained as 0·03 mgm. the first experiment was undertaken to determine whether this venom was detoxicated by the photodynamic action of methylene blue in a dilution of 1 in 100,000, and the result was definitely positive. They next proposed to determine the effect of varying the time of exposure from $1\frac{3}{4}$ to 17 minutes, using the same dilution of methylene blue and 80 lethal doses of *Daboia* venom in 1 cc. The mixture proved fatal after only 6 minutes' exposure, but not after $10\frac{3}{4}$ minutes. Next, the action of the methylene blue in constant strength was tested, while the strength of the venom was varied and, in accordance with expectations, increasing the strength of venom called for longer exposure for detoxication. As a corollary of this, the venom was used of constant strength (10 m.l.d.) and the methylene blue dilutions varied from 10^{-4} to 10^{-6}, and the first was found to have the strongest action. Further variations were made in the strength of the methylene blue, using 20 m.l.d. of the venom and the optimum concentration of the dye was found to be 1 in 50,000. The detoxication by the photodynamic action of methylene blue was shown to destroy the antigenic properties of the venom.

H. H. S.

i. TAYLOR (J.) & MALLICK (S. M. K.). **Observations on the Neutralization of the *Haemorrhagin* of Certain Viper Venoms by Antivenene.**—*Indian Jl. Med. Res.* 1935. July. Vol. 23. No. 1. pp. 121–130.

ii. —— & AHUJA (M. L.). **The Coagulant Action on Blood of *Daboia* and *Echis* Venoms and its Neutralization.**—*Ibid.* pp. 131–140.

iii. —— & ——. **Observations on Poisoning with the Venom of *Echis carinata* and its Treatment with a Heterologous Antivenene.**—*Ibid.* pp. 141–146. With 1 plate.

This article, though short, gives an account of work of considerable scientific value and of much practical importance and must have entailed

much careful research. The authors investigated the following :—(*a*) *The relationship of the anti-haemorrhagin titre to the antitoxic titre of V. russelli antivenene.* Protocols giving the results of many tests are reproduced, and it is seen that there is "a marked parellelism between the neutralization of the lethal effect of the venom by the serum and the results of the skin haemorrhagin test." (*b*) *The neutralization of the haemorrhagin of viper venoms by heterologous antivenenes. V. russelli* antivenene was tested against the haemorrhagin of *Echis carinata* and *V. berus* venoms. The antivenene of the African puff adder *Bitis arietans*, was tested against the venoms of the other three. It is shown that the viper venom haemorrhagins are neutralized by the other antivenenes ; probably, therefore, the haemorrhagin fraction is of the same nature in all. (*c*) *The toxicity of viper venoms after their haemorrhagin has been neutralized by heterologous antivenenes.* This was of special importance because the toxicity of viper venoms has been ascribed to their haemorrhagin. The authors found, however, that in the case of *V. russelli* and the others neutralization of the haemorrhagin does not diminish the m.l.d. as gauged by the intravenous test. Hence it follows that if death is due to the neurotoxin of the venom, heterologous antivenenes will be ineffective in treatment, though they may neutralize the haemorrhagin fraction.

ii. The authors have tested the coagulating action of the venoms mentioned on whole blood *in vitro* and also their action *in vivo*, injecting by different routes and in varying doses. In some cases intravascular clotting has been observed, in others total absence of clotting ; these contrasting effects call for explanation, and this is the object of the present study. As regards the coagulant action of the venom of *V. russelli*, the authors confirmed the work of MACFARLANE and Burgess BARNETT ; the action of *E. carinata* venom is less though still marked ; with cobra venom the coagulant action is small, though in high concentrations the rate of coagulation is increased somewhat. They also tested the neutralization of the coagulant action of venoms by homologous and by heterologous antivenenes. As the result of investigating the coagulant effect of viper venoms *in vivo* the authors found that :—

"(1) When a relatively high dose of the venom is given death may occur with extensive intravascular clotting. This is only seen when death occurs within a few minutes of injection of the venom. The tendency to massive intravascular clotting varies in different species and in individual animals.

"(2) Extensive intravascular clotting does not always occur when a dose approaching that which can be considered the minimum lethal dose is given, even when death occurs in two or three minutes after injection.

"(3) When death is delayed beyond a few minutes extensive intravascular clotting does not occur although small fragments of soft clot may occasionally be found in the heart.

"(4) In the case of delayed death from the action of *daboia* and *Echis* venoms or when sub-lethal doses have been given, the blood is fluid at death. This is also seen when the animal is killed within three days of the injection of venom."

The coagulant actions of the venoms of *V. russelli* and *E. carinata* are neutralized by their homologous antivenenes, but there is no reciprocal heterologous action. Further, when death occurs rapidly intravascular clotting may not be seen, and if survival takes place the blood is incoagulable for a time, gradually returning to normal. Rapid action may produce massive clotting of the blood *in vivo*, while slower action leads to defibrination of the blood with deposit of the fibrin on the vessel walls and thereby renders the blood incoagulable.

iii. Details of the symptoms during life and the findings post-mortem of monkeys dying from poisoning from experimental subcutaneous injection of the venom of *E. carinata* are described. The results of treatment by cobra and *V. russelli* antivenenes confirm what has been stated above, *viz.*, that though the haemorrhagin may be neutralized, other constituents of the venom are not. They therefore reduced the incidence of haemorrhagic symptoms and may consequently be beneficial to a certain degree when homologous antiserum is not procurable.

H. H. S.

CHOPRA (R. N.), CHOWHAN (J. S.) & DE (N. N.). **An Experimental Investigation into the Action of the Venom of** *Echis carinata.*—*Indian Jl. Med. Res.* 1935. Oct. Vol. 23. No. 2. pp. 391–405. With 5 figs. [25 refs.]

An article of much interest and full of detail. *Echis carinata* has been stated, half a century ago, to be third in the order of poisonous snakes of India, followed by *Daboia* (*V. russelli*), the banded krait (*Bungarus fasciatus*) and the king cobra. The authors' experiments, however, do not support this view. They tested the action of *Echis* venom on lower forms of life such as *Paramoecium caudatum*, then on frogs, guineapigs, mice, cats and rabbits. The effects on the latter as regards blood pressure, the heart muscle, the blood itself—coagulation or haemolysis—the respiratory system, unstriped muscle (uterus, intestine) and the nervous system were carefully observed and recorded.

The authors found that the venom of *E. carinata* was less toxic than that of *V. russelli* or the cobra, at all events it was slower in action, because absorption is delayed (though sudden death will result if the venom is injected directly into a blood vessel). Locally, there is inflammation with oedema and perhaps gangrene, bleeding occurs from the mucous membranes. The venom contains enzymes, albumoses and globulins. Thrombin is present in large quantities. Splanchnic vessels are dilated and the abdominal organs become engorged, the peripheral vessels may constrict to counteract the fall in blood pressure, but if the dose of venom is large death occurs in collapse. The fall of blood pressure is not central, nor of cardiac origin. It acts on the intima of blood vessels, leading to the extravasation of sero-sanguineous fluid. Haemorrhagins are at least ten times as strong as that in *V. russelli* venom and a coagulant ferment weaker than in the latter. There is also a neurotoxin present. It has no marked action on the respiratory centre, the effect in this regard being probably secondary to fall of blood pressure and failure of blood supply. It has a marked curara-like action on nerve endings. Death is due primarily to circulatory failure, analogous to that in histamine shock. In delayed poisoning " there may be complete failure of the higher controls and cutting off of all central impulses to the periphery due to the curara-like action of the venom on the motor end-plates."

H. H. S.

BEERENS (Julien) & CUYPERS (Hubert). Action du venin de cobra sur la circulation. [**Action of Cobra Venom on the Circulation.**]—*Bruxelles-Méd.* 1935. May 12. Vol. 15. No. 28. pp. 757–771. With 13 figs. [47 refs.]

The species of cobra whose venom was employed in this study is nowhere mentioned, but the unit is the minimum needed to kill a mouse of 20 gm. in 5–7 hours, *i.e.*, about 0·01 mgm. The fatal dose

killing a rabbit in 24 hours was found to be 0·005 gm. per kilo body weight and for a guineapig 0·004 gm. per kilo or 50 and 40 units respectively.

The authors investigated the blood pressure, pulse and respiration rates following intravenous injection in the marginal ear vein of the rabbit. This was found to produce a transient fall of blood pressure, at times preceded by a slight rise due to sympathetic stimulation. The fall occurs even after section of the vagus, consequently it is held to be due to a reflex *via* the nerves of Hering. As regards the electro-cardiographic changes, these varied with the doses, whether single non-fatal doses or small doses repeated daily. The action is of a checking or brake character (une action freinatrice), inhibiting the Keith-Flack node and then the autonomic tissue, leading to retardation of the propagation of ventricular stimulus and, if the poisoning is severe, to a blocking of the bundle of His. In a normal animal complete auriculo-ventricular dissociation may occur in the agonal period, but in animals with severed vagi an isorhythmic dissociation may be noticed at the onset of the poisoning. The article is illustrated by reproduction of several sphygmographic tracings. *H. H. S.*

VELLARD (J.) & MIGUELOTE-VIANNA (M.). Modifications sanguines provoquées par les venins ophidiques (troisième mémoire). Variations de la réserve alcaline. [**Changes in the Blood resulting from Snake Venoms.**]—*Ann. Inst. Pasteur.* 1935. Aug. Vol. 55. No. 2. pp. 148–152.

This is the third memoir published on this subject by the authors [see this *Bulletin*, 1934, Vol. 31, p. 101 ; 1935, Vol. 32, pp. 376, 380].

The present is a report of an investigation of the alkali reserve following administration of the venoms of *Crotalus terrificus*, *Lachesis atrox*, and *Naia tripudians*, intramuscularly, subcutaneously, intraperitoneally, and, in one case, intraspinally, into dogs.

In all, 24 animals were the subjects of experiment ; 14 with the venom of *C. terrificus*, 7 with that of *M. tripudians*, and 3 with that of *L. atrox*. The blood samples were taken by cardiac puncture (*a*) a few minutes prior to injection of the venom ; (*b*) from 1–12 hours after injection ; (*c*) at the time of stoppage of respiration or of cardiac action. If the interval between these last was prolonged, other samples were taken during this period. Protocols are reproduced giving some details, which may be summarized as follows :—

With all the venoms, there was a very slight reduction of the alkali reserve during the early stages of intoxication ; in the agonal period this was more marked in the case of poisoning by the venom of *N. tripudians*, but not so great as with *Crotalus* and *Lachesis*. It is to be noted in this regard that the *Crotalus* and *Naia* venoms act in different ways on respiration ; both, it is true, have a paralysing effect, but the venoms of *Crotalus* and *Lachesis* do this by bulbar action—respirations diminish in frequency but increase in amplitude ; later the breathing is almost solely diaphragmatic, the movements become slower and slower and cease almost at the same time as the heart's action. *Naia* venom, on the contrary, has a curarizing action—asphyxia results from paralysis of the thoracic muscles and the heart may go on beating for 10–15 minutes after respiration has ceased. It is this difference of action which may account for the different results of the estimated alkali reserve. Other phenomena which may also play a part are the

action of the toxin on the liver cells, the renal function, variation in glucose, in lactic acid, in calcium, potassium and blood phosphorus. Until these various factors have been studied, it will not be possible to determine with certainty the mechanism of the variations in alkali reserve which follow poisoning by snake venoms. *H. H. S.*

LINK (Th.). Der Einfluss der Schlangengifte auf die Blutgerinnung. [**The Action of Snake Venom on Coagulation of the Blood.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1935. Aug. 30. Vol. 85. No. 5/6. pp. 504–512. [14 refs.]

B. A. HOUSSAY and A. SORDELLI divided snake venoms into two classes :—those that cause coagulation, and those that prevent it. Though the latter destroy the thrombokinase, they compensate for this by their own thrombin-like action ; but, when they are very concentrated, they may destroy fibrinogen and so hinder coagulation. The object of Link's work was the verification of these results and their extension to other venoms. Venom of the following snakes was used :—

COLUBRIDAE.—*Naja* (2 species), *Sepedon*, *Notechis*, *Bungarus*.
VIPERINAE.—*Vipera* (7 species, including *russelli*), *Bitis*.
CROTALINAE.—*Lachesis* (3 species), *Crotalus* (5 species).

The author first determined whether the venoms favoured or hindered coagulation of the blood ; in the former case, which of the following were affected by the venom : thrombokinase, thrombogen, thrombin and fibrinogen. The preparation of these substances (from the liver of the guineapig and plasma of the sheep) is described. The experiments were made according to the method given by HIRSCHFELD and KLINGER (*Ztschr. f. Immunitätsf. u. Experim. Therap.*, 1914, Band 20, p. 51). The results obtained by Link are given rather briefly with each venom, and the author summarizes them as follows :—

(1) Snakes whose venom contains no coagulating constituent.
- (*a*) Which destroy thrombokinase.
  Naja tripudians, *N. flava*, *Sepedonhaemachates*.
- (*b*) With a proteolytic action.
  Vipera latastei, *Bitis arietans*, *Crotalus ruber*, *C. atra*, *C. horridus* (the last two have also a destructive action on thrombogen).
- (*c*) Without a proteolytic action.
  Mesocoronis, *Daboia* (=*V. russelli*), *Bungarus fasciatus*, *Crotalus terrificus*.

(2) Snakes whose venom contains a thrombin-like coagulating constituent.
- (*a*) With a proteolytic action.
  Vipera berus (and three other species of *Vipera*), *Lachesis* (three species).
- (*b*) Without a proteolytic action.
  Notechis scutatus, *Crotalus adamaalton*. *H. J. Walton.*

BARNETT (Burgess). **The Haemostatic Uses of Snake Venom.**—*Proc. Roy. Soc. Med.* 1935. Sept. Vol. 28. No. 11. pp. 1469–1472 (Sect. of Med. pp. 93–96).

Brief notes are given of several patients with severe and previously uncontrollable haemorrhage treated successfully with venom of *V. russelli* in a dilution of 1 in 10,000 used on gauze as a plug. Most were

haemophilics but one was a boy of 4 years suffering from purpura haemorrhagica. When the situation of the bleeding is such that the plug can be applied with pressure the success is immediate, the only danger being recurrence of haemorrhage from disturbance of the clot on removal of the plug ; this, however, is easily controlled by further application of the venom. At times there is difficulty owing to the site of haemorrhage, *e.g.*, in a boy of 18 months, a haemophilic, who was bleeding from a bitten tongue. He lost so much blood that two transfusions were needed. The haemorrhage was finally controlled by a dental plate being fixed over the tongue to maintain the venom-soaked dressing in position. According to the reports on a large number of patients this form of treatment was unsuccessful on two occasions only. Of one the author has no details to give [but see CAMBROOK below], the other was found to have a low excretion of ascorbic acid and was probably suffering from subclinical scurvy. The venom has been employed also to stop capillary oozing after breaking down adhesions of the liver, after decapsulation of the kidney, after tonsillectomy and prostatectomy. In no instance have any toxic symptoms attributable to the venom been observed. *H. H. S.*

CAMBROOK (J. Draper). **Snake Venom and its Use in Dental Haemorrhage.**—*Proc. Roy. Soc. Med.* 1936. Jan. Vol. 29. No. 3. pp. 281–282 (Sect. Odontology pp. 19–20).

Experiment has shown that the venom of *Daboia* (*V. russelli*) in a dilution of 1 in 10,000 will coagulate ten times its volume of haemophiliac blood in 20 seconds or less. In dentistry, as in some other conditions in which it is locally applied, the liquid should be sterile since it is in contact with a raw surface and this sterilization is accomplished by filtration, since sufficient heat cannot be used without destroying the coagulant property. It is unstable when kept in solution unless in an ice-chest ; this difficulty was overcome by evaporating the venom with saline under reduced pressure [but see LAIGNEL-LAVASTINE, HUËT & KORESSIOS below on the effect of saline on venom], so that when required the proper strength of 10^{-4} was obtained by addition of water.

The author has now employed the venom in more than 50 cases, some of them haemophilics. He prefers block anaesthesia to local because injection must cause some, though perhaps only slight, damage near the socket. After the extraction, he applies a " squat plug " of cotton wool soaked in hot venom so that pressure is exerted on the *edge* of the socket, and the plug becomes mushroom-shaped. The patient bites on a gauze roll so that pressure is intermittent ; this the author finds preferable to an appliance to keep up constant pressure, which may injure the socket and cause extravasation into the tissues. If there has been gross sepsis, he allows oozing between application of the plugs. He reports two cases of failure, one with signs of subclinical scurvy [see BARNETT, above], the other was a patient with a tear in the floor of the mouth following extraction by an outside dentist. Bleeding was from the sublingual tissues and stopped spontaneously. *H. H. S.*

BAKER (Geoffrey A.) & GIBSON (Paul C.). **A Case of Haemophilia treated with Russell Viper Venom.**—*Lancet.* 1936. Feb. 22. p. 428.

A most interesting record. A boy of 11 years, a haemophilic, came to the Torbay Hospital with a history of 10 days' bleeding from the

gum round an upper incisor. On admission he was pale and collapsed. Blood examination showed bleeding time 3½ minutes, coagulation time 7½ minutes. With a mouth-wash of acriflavine bleeding stopped, but a few days later recurred and it was found necessary to extract the tooth, 3 weeks after the first starting of the bleeding. [In the report November appears to be a misprint for October.] Oozing began about 8 hours after, and continued in spite of plugging with various substances, adrenalin, turpentine, tannic acid. Blood transfusion was given, but the incisions for this (two had to be made, the first revealing a vessel too small for the needle) continued to ooze and the boy's condition was becoming very grave. Three days after the transfusion venom of *V. russelli* was obtained and applied locally to the three bleeding sites, in a dilution of 1 in 10,000 on gauze plugs, repeatedly during 24 hours. The patient gave no further cause for anxiety; firm, elastic clots formed and the wounds healed. Some 3 months later, bleeding started round another tooth; this was extracted and the socket plugged as before with gauze soaked in the venom. Oozing was only slight and ceased completely in 3 days. The author concludes:—

"Special points of interest are: (1) The immediate haemostasis in the tooth socket. (2) The effectiveness at a site where application was not easily sustained; the tooth socket was shallow and could not be packed very efficiently. (3) The firmness of the clot; this was particularly noticeable in the socket, where the clot felt to be of the consistency of rubber. (4) The complete absence of any undesirable effects, although a considerable amount of the venom had to be used." *H. H. S.*

LAIGNEL-LAVASTINE, HUËT (P. C.) & KORESSIOS (N. T.). Sur les propriétés coagulantes du venin de vipère Daboia. [**Coagulant Properties of the Venom of** *V. russelli*.]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1935. Nov. 25. 51st Year. 3rd Ser. No. 29. pp. 1529–1533.

The authors record their experiences with some 50 cases in which they employed tampons soaked in the venom to stop surface bleeding. As a diluent they used distilled water, as they found the action was reduced when physiological saline was used, while calcium chloride even in minute amount prevented its action. They used a strength of 0·5 mgm. in 5 cc. of water (*i.e.*, 1 in 5,000). Haemorrhage from tonsil or mastoid operation was stopped in one minute, whereas a tonsil untreated oozed for half an hour. The method is not applicable to large haemorrhages, such as arterial bleeding. No toxic effects, either immediate or remote, were seen in any of their patients, even when several tampons had to be applied. *H. H. S.*

ROSENFELD (Samuel) & LENKE (Sidney Edward). **Tiger-Snake Venom in the Treatment of Accessible Hemorrhage.**—*Amer. Jl. Med. Sci.* 1935. Dec. Vol. 190. No. 6. pp. 779–791. With 1 fig. & 1 graph. [11 refs.]

For the investigation recorded in this article the authors selected the venom of the Australian tiger snake (*Notechis scutatus*) for three reasons: (1) It quickly produces a firm clot of blood *in vitro*; (2) It hastens clot retraction; (3) It does not require preliminary collaborating factors—calcium, thromboplastin, prothrombin. They give a list of six snakes whose venoms are known to be potent coagulants. In the

order there stated the venom of *V. russelli*, which is used in England, is the weakest: *Notechis scutatus* (Tigersnake, Australia), *Pseudechis porphyriacus* (Black snake, Australia), *Echis carinatus* (Phoorsa, India), *Lachesis neuwiedii* (Urutu, Brazil), *Bothrops atrox* (Fer-de-lance, America), *V. russelli* (Daboia, India).

The authors carried out a preliminary titration of the coagulant power of the venom, and devised a "clotting unit" for standardizing batches of venom. A clotting unit they define as: "The clotting power present in the highest dilution of venom which will produce coagulation of freshly citrated plasma within 2 minutes, the plasma being added to the various tubes of diluted venom in the proportion of 4 to 1. . . . Coagulation within a period of 2 minutes was selected because: (1) it is the nearest approach to clinical requirements; (2) several tubes seem to clot almost simultaneously at about this time; (3) the more delayed clots are of poorer consistency." If n represents the number of the last tube in which clotting occurs within 2 minutes, then the number of units per cc. of the unknown solution $= 5 \times 2^{n-1}$. Estimated thus 1/5,000 solutions of the various batches of the venom used by the authors proved to contain at least 7 units per cc. The venom solutions were prepared thus:—

"The dried venom was pulverized, and 100 mg. lots were weighed out on a quantitative balance. Sterile normal saline solution was added to produce the required dilution, 1/100 volume of 1 per cent. merthiolate solution being included. The resultant saline solutions of venom (1/1,000 and 1/5,000 containing 1/10,000 merthiolate) were stored in the ice box for 2 days and then tested for sterility. Aerobic cultures on blood plates and glucose broth were made. Since anaerobic spore-bearing pathogens have been described in snake venom each solution of venom was cultured anaerobically and also was injected in sublethal dosage (0·1 cc. of 1/5,000 solution) into the hamstring muscles of a guinea pig. No contaminant was found after the routine treatment with merthiolate. Since sterilization by ultrafiltration or heat seriously impaired the clotting power of the venom, they were not employed."

The authors then give details of 8 patients suffering from various haemorrhagic conditions treated with the venom in dilution of 1 in 5,000. The cases include haemophilia (2), purpura secondary to arsenic poisoning, essential thrombo-cytopenic purpura (2), multiple hereditary telangiectases, carcinoma of pancreas with jaundice, and a patient with a history of prolonged post-operative haemorrhages with, on this occasion, continuous oozing from leech-bites. Though successful in checking the bleeding, the venom did not prevent later recurrence nor did it affect the course of the disease of which the haemorrhage was a symptom.

H. H. S.

PECK (Samuel M.) & ROSENTHAL (Nathan). **Effect of Moccasin Snake Venom (*Ancistrodon piscivorus*) in Hemorrhagic Conditions.**—*Jl. Amer. Med. Assoc.* 1935. Mar. 30. Vol. 104. No. 13. pp. 1066–1070.

Moccasin (*Ancistrodon piscivorus*) venom was used in a 1 : 3,000 dilution of physiological saline, with 1 : 10,000 sodium merthiolate as preservative. An initial dose of 0·4 cc. was given, subcutaneously (being less painful than intradermally, as formerly given) and increased to 1·0 cc. For children under 10 years the minimum was 0·2 and the maximum 0·6 cc. Injections were usually given twice a week, but in serious cases more often. Most patients developed hypersensitivity at

the fourth or fifth injection (in 10–14 days) and had to be desensitized.

Details are given of: (1) Five cases of epistaxis and 2 of haemoptysis. In some of these haemorrhage did not recur after the first few injections and in most there was no recurrence for months after cessation of treatment. (2) Seven patients with menorrhagia. In some all the usual methods of treatment had failed—curettage, serum, calcium, transfusions. The bleeding was controlled by the venom injections, but there was a likelihood of recurrence after cessation of treatment, a recurrence controllable by further injections. (3) Ten cases of purpura of various kinds; the treatment proved unavailing in three. (4) Four cases of multiple hereditary telangiectases, with epistaxis. These were definitely controlled by the venom, but the treatment must be maintained indefinitely. (5) Thirteen cases of thrombocytopenic purpura. Nine improved, four did not. (6) Three cases of haemophilia; in these it failed.

The authors state that except in thrombocytopenic purpura the blood picture is unchanged, the bleeding time is not affected and that the treatment "is of no value in cases of congenital haemophilia."

[See above MACFARLANE and Burgess BARNETT, on the value of the venom of *Vipera russelli* in haemophilia.] *H. H. S.*

GREENWALD (Harry M.). **Dilute Snake Venom for the Control of Bleeding in Thrombocytopenic Purpura.**—*Amer. Jl. Dis. Children.* 1935. Feb. Vol. 49. No. 2. pp. 347–352. With 3 charts. [11 refs.]

Having noted the good results reported by S. M. PECK from the use of moccasin snake venom (*Ancistrodon piscivorus*) in cases of thrombocytopenic purpura the author made trial of it in three similar cases of his own. His procedure was to give intradermal injections of a 1 in 3,000 solution of the venom in physiological saline starting with 0·1 cc., and increasing gradually to 0·4 or even 0·6 cc., injecting every other day for the early doses, later every 3–4 days, the whole course of treatment extending from 4–20 weeks.

In all three active bleeding stopped after 3 or 4 injections; in one the bleeding time was reduced from 50 minutes to 3 minutes after 7 weeks' treatment; in the second from 20 to 5 minutes in 24 days; in the third from 32 to 6 minutes in 10 days and to 4½ minutes in 32 days. The platelet count increased from 10,000 to 175,000 in 15 days and to 220,000 in 80 days in one case; from 0 to 220,000 in 26 days in another (but later fell to 170,000); in the third from 75,000 to 125,000 in 47 days.

These results are impressive, but, as the author remarks, not too much can be based on so few cases; moreover, spontaneous remissions occur in this disease. *H. H. S.*

PECK (S. M.), CRIMMINS (M. L.) & ERF (Lowel A.). **Coagulating Power of *Bothrops atrox* Venom on Hemophiliac Blood.**—*Proc. Soc. Experim. Biol. & Med.* 1935. June. Vol. 32. No. 9. pp. 1525–1527.

The authors refer to the work of MACFARLANE and Burgess BARNETT on the employment of the venom of Russell's viper as a haemostatic. They themselves have worked with that of the Fer-de-Lance (*Bothrops atrox*), easily obtained from Central and South America and tolerating captivity well, so that a supply of the venom is readily available and cheap. They found that when given *intra venam* the m.l.d. for pigeons

of 250–350 gm. was 0·2–0·25 mgm., and for rabbits of 2 kgm. 0·015–0·02 mgm.; thus, pigeons are more resistant to the neurotoxins of the venom than are rabbits.

Its coagulating power was tested on two haemophilics; one was aged 25 years and his clotting time was 58–60 minutes, the other aged 36 and clotting time 100–106 minutes. To 2 cc. of the haemophilic blood 0·5 cc. of the venom was added in dilutions up to 1 in 10,000,000. The optimum concentration was found to be 1 in 10,000, the action increased up to this dilution, and then diminished. The first patient's clotting time was reduced to 15 seconds with the optimum dilution. In the case of the second patient the 1 in 10,000 dilution (0·5 cc. to 2 cc. blood) caused clotting in 1½ minutes and 1 in 100,000 in 4 minutes. Bothrops venom would thus appear to be more potent than that of Russell's viper. Since venoms often contain bacteria the filtrate through a Zeiss or a Berkefeld filter was tested. The neurotoxicity, tested in pigeons, was reduced but the clotting effect remained unchanged. Moccasin venom in dilutions from 1 in 2,000 to 1 in 20,000 was also tried with the blood of the same patient, but it either had no effect or else prolonged the clotting time. *H. H. S.*

MACFARLANE (R. G.) & BARNETT (Burgess). **Russell's Viper Venom.** [Correspondence.]—*Lancet.* 1936. Feb. 29. p. 509.

The authors' attention has been drawn to a statement, to which wide publicity has been given and attributed to a noted New York physician, that the use of snake venom as a haemostatic has been practically given up in the U.S.A. If this gains ground a proved valuable means of arresting haemorrhagic states, in haemophilics and others may fall into unmerited disrepute. They state that if moccasin venom is used (as it is in the United States) local reactions occur at the site of injection, but in England the venom of Daboia (*Vipera russelli*) is used and by local tampon not by injection, and that among the comparatively large number of cases in which it has been employed, they have not observed any ill-effects nor any reactions general or local (other than coagulation of the blood). Apart from this venom, cobra venom has been used as an analgesic in malignant growths, cobra and puff adder venom for epilepsy, and moccasin venom for haemorrhagic conditions and some skin affections. *H. H. S.*

MACHT (David I.). **Experimental and Clinical Study of Cobra Venom as an Analgesic.**—*Proc. Nat. Acad. Sci.* 1936. Jan. Vol. 22. No. 1. pp. 61–71. With 1 fig. [22 refs.]

This work as carried out at the Pharmacological Research Laboratory, Baltimore. Cobra venom—*Naia naia, N. haie* and *N. tripudians*—was used. In order to obtain a product free from bacterial contamination the preparation was made thus: Dried scales of the venom were dissolved in physiological saline, put up in glass ampoules, sterilized at a temperature not above 60°C. and assayed by the mouse method. When kept in the dark and in the ice-chest the preparation remained sterile and kept its potency for many months.

One hundred and fifteen patients received the treatment, of whom 105 were suffering from carcinoma, the others from Raynaud's disease, neuralgia, arthritis, etc. Of the cancer cases there were 14 of breast, 18 of uterus (14 cervical), 10 of rectum, 8 of jaw, 4 of ovary, 4 of tongue,

7 of bladder and various others in smaller numbers. The usual method of procedure was to give a small dose of 2 or 3 mouse units to ascertain if the patient had any idiosyncrasy; if not, a full dose of 5 units was injected (usually intramuscularly) next day and repeated daily until relief of pain was noted or the venom proved ineffectual. Ten histories were not complete; the remaining 105 are analysed. Thirty-eight (36·2 per cent.) obtained marked relief, 30 (28·6) definite relief, 23 (21·9) slight relief, in 5 (4·7) the result was doubtful, and in 9 (8·6 per cent.) there was no relief; that is, 86·7 per cent. obtained relief and 64·8 per cent. definite and marked relief of pain. Further examination to determine the pharmacodynamic action of the venom led to the conclusion that the seat of action was the higher nerve centres, resembling morphia in this respect, but not leading to addiction nor to any dangerous by-effects. *H. H. S.*

CHOPRA (R. N.) & CHOWHAN (J. S.). Snake Venoms in Pharmacology and Therapeutics.—*Indian Med. Gaz.* 1935. Aug. Vol. 70. No. 8. pp. 445–453. [24 refs.]

MACCLURE (E.). Glomerulo-nephrite aguda diffusa, consequente a envenenamento por cobra (*Brothrops jararacussú*). [**Acute Diffuse Nephritis following Cobra Bite** (*Bothrops jararacussú*).]—*Bol. da Secretaria Geral de Saúde e Assistencia.* Rio de Janeiro. 1935. Dec. 15. Vol. 1. No. 3. pp. 35–49. With 7 plates. French summary. [13 refs.]

A man of 29 years, when in prefect health, was bitten on the right hand by a cobra. He received antiserum 4 hours afterwards. Three days after admission to hospital oliguria set in, passing in another three days to complete anuria with hypertension and azotaemia and death occurred. The chief post-mortem finding was an acute glomerulonephritis; the condition is described in detail in the text and there are photomicrographs showing clearly the histological changes caused. Haematuria has been observed in others bitten by a snake of this species. *H. H. S.*

PEPEU (F.). Prove sperimentali di vaccinazione antiofidica. [**Experimental Prophylaxis against Snake Venom.**]—*Atti V. Congr. Naz. Microbiol., Cagliari 27–31 Maggio 1934.* pp. 158–161.

The addition of 0·4 per cent. formol [? 10 per cent. formaldehyde] to snake venom and maintenance at 38°C. transforms the venin into anavenin [analogous to anatoxin in diphtheria] after an interval varying from 40 days to 3 months. *Vipera ammodytes* was used for the tests. Such an anavenin is no longer toxic but possesses immunizing properties. The author tested it on a number of dogs, the poison itself being injected into the paw or the nose, and concludes that the method should prove very useful prophylactically for animals likely to be exposed to bites from this viper. *H. H. S.*

CHOPRA (R. N.) & CHOWHAN (J. S.). **Snake Bites and their Treatment in India.**—*Calcutta Med. Jl.* 1935. Mar. Vol. 29. No. 9. pp. 459–485. With 2 plates. [16 refs.]

A good and useful general account of snakes, snake-bites and their treatment; it comprises a review of the subject, bringing forward no

new matter, but summarizing present knowledge. The subject is dealt with under the following sections:—Recognition of poisonous snakes and their ready differentiation from non-poisonous; the mechanism of snake bites; the symptoms produced by bites of cobra, krait, *Echis carinata* and *V. russelli*, and finally treatment. The last is considered under four heads: (*a*) Prevention of passage of the poison into the general circulation; (*b*) local neutralization of the venom; (*c*) specific antisera, giving methods of preparation and dosage; (*d*) treatment of special symptoms and complications. *H. H. S.*

WERWATH (K.). Verletzungen durch Kreuzotterbiss.—*Med. Klin.* 1935. Dec. 20. Vol. 31. No. 51 (1618). pp. 1667–1669.

AHUJA (M. L.). **Specificity of Antivenomous Sera with Special Reference to Sera prepared with Venoms of Indian and South African Snakes.**—*Indian Jl. Med. Res.* 1935. Jan. Vol. 22. No. 3. pp. 479–484.

The author obtained from South Africa dried venom of the Cape cobra (*Naia flava*) and concentrated antivenenes, with a view to carrying out the following series of tests:—

1. Comparison of the toxicity of Cape cobra venom with that of Indian cobra (*Naia naia*). In this and the other experiments related below pigeons of about 300 gm. were utilized, and injections were made into the pectoral muscles. Results were recorded 18–20 hours later.

The toxicity was found to be the same or very nearly so, *viz.*, 0·3–0·4 mgm. being the respective lethal doses.

2. Potency of Cape cobra antivenene against the venom of *Naia naia*. 0·3 cc. protected against 0·8 mgm. of the Indian cobra venom.

3. The reverse of the last, the potency of Indian cobra antivenene against the venom of *Naia naia*. 0·5 cc. protected against 0·8 mgm. of the venom. Clearly, the two antisera are to a great degree protective against the other venoms.

4. Potency of these two antivenenes against the venom of the banded krait (*Bungarus fasciatus*). The results were negative; neither antivenene protected.

5. Comparison of the haemolytic properties of the Cape and African cobra venom showed them to be practically the same. Further the antivenene of each could inhibit the haemolysing effect of the other venom.

It follows from the above that these two cobras have the same type of neurotoxin and haemolysin in their venoms and that antivenene prepared in India against *Naia naia* will be equally serviceable as that prepared in South Africa against *N. flava* and *vice versa*. [See also GRASSET & ZOUTENDYK above.] *H. H. S.*

PEPEU (F.). Ricerche sulla specificità dei sieri antiofidici. [**The Specificity of Snake Antivenenes.**]—*Atti V. Congr. Naz. Microbiol., Cagliari, 27–31 Maggio 1934.* pp. 161–165. [14 refs.]

The author's experiments were carried out on white mice, with the venoms of *Vipera ammodytes*, Aspis and Lebetina, and the following sera: I.S.M. 293 and 132, Pasteur E. R., Pasteur A. N., Vienna, Anticrotalus and Antibothrops both from Butantán. He found the three venoms showed remarkable affinity. The anti-ammodytes and

anti-aspis neutralized completely all three ; anti-bothrops neutralized that of ammodytes and of lebetina, but only to a small degree that of aspis. He concludes that the anti-ammodytes serum can be utilized for treatment of poisoning by all the European vipers and by the Asian lebetina. *H. H. S.*

MALLICK (S. M. K.). **The Applicability of Flocculation Tests for Standardization of Antivenene.**—*Indian Jl. Med. Res.* 1935. Oct. Vol. 23. No. 2. pp. 525–529.

If the potency of antivenene could be determined by flocculation tests, analogous to that of RAMON in titrating diphtheria antitoxin, much time would be saved as well as cost in animals. The author carried out a series of pigeon-tests with cobra venom and horse antisera but unfortunately found that the method of flocculation is not applicable to antivenenes. Five out of 11 horses immunized did not show flocculation though a wide range of mixtures was tried ; the other six gave flocculation but not in constant proportions as a group, though individual horses did furnish constant results. By the pigeon test, though prolonged immunization gave increase of titre of the antivenene, the flocculation was the same with that of low and that of higher titre. The author concludes, therefore :—

"The irregularity of the results of flocculation tests of antivenene, and the absence of any exact relationship of the mixtures employed to the titre ascertained by pigeon tests, make the method unsuitable for application in standardization of antivenene." *H. H. S.*

BOULNOIS (J.). Efficacité du sérum antivenimeux dans le traitement des hémoptysies tuberculeuses. [**Cobra Antivenene in the Treatment of Haemoptysis in Pulmonary Tuberculosis.**]—*Rev. Méd. et Hyg. Trop.* 1935. July–Aug. Vol. 27. No. 4. pp. 213–214.

Two cases are mentioned and they are noted here because the title may lead others to make trial of the method. The reports, however, are not convincing. The serum was injected intravenously in doses of 10 cc. In both cases, the spitting of blood continued for some time, in one patient for 48 hours, to reappear again 3 days later ; in the other, the bleeding ceased in 3 hours, but returned 2 hours later. Seeing that haemoptysis often ceases spontaneously, these cases are not convincing of the benefit of antivenene. *H. H. S.*

DE CARVALHO (Jarbas). Accidentes mortaes pela picada de escorpião. [**Fatal Results from Scorpion Sting.**]—*Rev. Med.-Cirurg. do Brasil.* 1935. Nov. Vol. 43. No. 11. pp. 362–367. With 1 fig.

One of the most poisonous, if not actually the most poisonous, of scorpions is *Tityus serrulatus* of Brazil. It is generally held that scorpion sting, though very painful, is not fatal except to young children or the debilitated. Several cases in which the results were fatal have been reported not only in children but also in adults, according to the site of the injury and the quantity of poison inoculated. Notes are

given of 20 such, of ages varying from a few months to 48 years, and Dr. MAGALHÃES recorded that in one year there were 6,668 cases and 237 deaths, or 3·5 per cent. fatality. *H. H. S.*

CERVERA (Ernesto). Suero anti-alacránico. [**Scorpion Antivenene.**] —*Bol. Oficina Sanitaria Panamericana.* 1936. Feb. Vol. 15. No. 2. pp. 142–149. With 3 charts.

The author, who is Director of the Institute of Hygiene, Mexico, first reviews briefly the history of the preparation of scorpion antivenenes, mentioning the work of C. TODD with the poison of *Buthus quinquestriatus*, that done at the Instituto Butantán, São Paulo, on *Tityus bahiensis*, at Durango on *Centruroides suffusus*; by HOFFMAN and VARGAS on the Nayarit scorpions, *C. noxius*, *C. limpidus* and *C. suffusus*. Records of cases are related from various district returns. In Iguala there have been no deaths among nearly a thousand cases; in nearly all a single dose of 5 cc. for children and 10 cc. for adults sufficed, but one child of 8 years with severe toxic symptoms was given 10 cc. During the 11 years 1924–34 there were in the Municipality of Iguala 136 deaths from scorpion sting; there were two adults, 50 and 58 years, the rest were under 8 years and 11 were less than 3 weeks old; in Colima one death occurred, a child of 11 months who did not receive the serum till moribund. In Tomatlán 27 cases between 2 and 66 years, all recovered; 19 had 5 cc., 6 had 10 cc. and 2 had 20 cc. It was usually given intramuscularly, occasionally intravenously, and in two severe cases by both routes. In Durango Municipality 275 cases were reported during 1934, but only two were fatal, a child of 7 years who had no serum and one of 3½ months who did not receive it till too late. In the town of Durango, DE LA PEÑA and VENZOR record 1,608 deaths from scorpion sting in 36 years, 1891–1926, an average of 44·6; in the next five years there were another 109 or 22 per annum. *H. H. S.*

SERGENT (Etienne). Action de l'injection sous-cutanée d'eau contre des doses mortelles de venin de serpents.—*C. R. Acad. Sci.* 1935. Feb. 25. Vol. 200. No. 9. pp. 789–790.

——. De l'emploi possible des injections sous-cutanées d'eau physiologique contre l'envenimement par morsure de vipère ou piqûre de scorpion. [**Injections of Physiological Saline in Viper and Scorpion Poisoning.**]—*Bull. Acad. Méd.* 1935. Mar. 19. 99th Year. 3rd Ser. Vol. 113. No. 11. pp. 363–364.

The first paper and the first part of the second paper refer to the same experiment.

Dr. Sergent reports that subcutaneous administration of physiological saline in 151 mice was followed by survival of 25 of them (16 per cent.) when the animals were subsequently inoculated in another part of the body with "several" fatal doses of venom of *Cerastes cornutus*. All of 174 controls died and treatment by specific antivenene saved only 59 (39 per cent.) of another 151. He suggests that the saline acts by diluting the toxin before it has time to produce its usual effects. He has obtained similar results using the venom of *Buthus occitanus*, and adds that where the specific serum is not obtainable, the method of subcutaneous saline injection in large amounts should be tried in treatment. [No figures are given as to the size of dose employed in the experiments, nor any protocols. Also in the experiments,

the saline was injected prior to the venom. Before recommending its employment as a form of treatment, it would be well to test the effect when administered experimentally after the venom.]

H. H. S.

BLAIR (A. W.). **Spider Poisoning : Experimental Study of the Effects of the Bite of the Female** *Latrodectus Mactans* **in Man.**—*Arch. Intern. Med.* 1934. Dec. Vol. 54. No. 6. pp. 831–843. With 4 figs. [23 refs.]

——. **Life History of** *Latrodectus Mactans.*—*Ibid.* pp. 844–850. With 2 figs. (1 coloured).

This spider, *Latrodectus mactans*, known colloquially as the Black Widow, is the only one in the United States of America proved to be poisonous to man. In the second paper which is well illustrated the author gives an account of its appearance, habitat, feeding habits, mating, eggs, development and length of life. In the first he gives a full and very graphic account of the effects of a bite which he allowed to be inflicted upon himself with a view to testing which of the conflicting opinions as to its noxiousness was true. He allowed the spider to bite him on the terminal phalanx of the left little finger and symptoms soon set in.

The bite felt like the prick of a sharp needle ; in 15 minutes the pain, a dull ache, increased and extended to the upper arm ; the superficial cubital gland was tender (and remained so for a fortnight), and the phalanx of the bitten finger was purple-red, swollen and very painful ; in 20 minutes there was pain over the whole arm and left side of the chest ; in 30 minutes praecordial pain. These symptoms are regarded as belonging to the period of lymphatic absorption. During the succeeding 2½–3 hours, more serious symptoms prevailed from vascular dissemination. Fifty minutes from the time of biting, drowsiness came on, blood pressure was 106 systolic, 78 diastolic ; in an hour (*i.e.*, ten minutes later), transient epigastric pains, general flushes ; leucocytes 8,400 per cmm. ; 5 minutes later, epigastric pain more marked and in another 10 minutes, general malaise, pain in neck muscles, pulse rate 62. In 1¾ hours from the bite, severe pain in back, chest and abdomen, speech difficult and jerky, respirations rapid and laboured, abdomen rigid, pulse 60. In 2 hours, pain now in legs, also inspiration gasping, expiration laboured and accompanied by a groan ; in 5 minutes more, inability to stand, legs flexed, tremor, collapse ; finger swollen, tender, cyanotic and painful. In 2¾ hours from onset, spasm of flexors of forearms and hands, tingling in hands and feet, pulse rapid, thready, uncountable ; systolic pressure 75. This was followed by slight vertigo and throbbing in the head. Symptoms a little relieved by hot bath ; in 3 hours pains still more severe, respirations very laboured, patient writhing on the bed ; pulse weak, 120 ; pressure 80 systolic, 50 diastolic. Thereafter recovery was gradual. Vomiting took place 5¼ hours from the onset ; after 9 hours there was still great restlessness and severe pain in abdomen, back and legs ; pulse rate 78, pressure 154 and 92 ; leucocytes 18,200 per cmm. polymorphonuclears 82 per cent., no eosinophilia. Urine showed a trace of albumen, many red corpuscles, blood and granular casts next day, and leucocytes in blood numbered 19,150 per cmm. with 77 per cent. polynuclears, 18 lymphocytes and 5 large mononuclears. Later the same day the face was flushed and swollen, hands tremulous, a papular eruption was seen on the bitten finger and the ulnar aspect of the hand ; diarrhoea. On the second day after the bite, 49 hours, the patient felt much better, the face was less swollen and abdomen less tense, but there were pains still in legs and feet, with chills and sweating. From then onwards recovery was rapid.

The best treatment would probably be early incision at the site of the bite. This account settles definitely the question of the noxiousness of the poison injected by the bite of this spider, for the subject was a man, 32 years of age, in perfect health at the time. *H. H. S.*

FINLAYSON (M. H.). **"Knoppie-Spider" Bite.**—*South African Med. Jl.* 1936. Jan. 25. Vol. 10. No. 2. pp. 43–45.

"Knoppie Spider" is the colloquial name for at least three species of Latrodectus in South Africa, *viz.*, *L. geometricus*, *L. concinnus* and *L. indistinctus*. All are common in Cape Province; there may be confusion between the former two but the third is easily identified. *L. geometricus* and *L. concinnus* live in outhouses, and in walls and crevices of doors and windows, *L. indistinctus* in the cornfields and on the veldt. The average yield of poison, after evaporation to the dry state, from *L. geometricus* was 1 mgm., from *L. concinnus* about 2 mgm., and from *L. indistinctus* 3–4 mgm. The former two are less toxic than the last, the lethal dose of which for mice is 2–4 times that of cobra, but as the spider venom is obtained in a cruder state, it is probable that, if pure, the toxicity would be about equal to that of the Cape cobra. The antivenenes obtained by 4 intravenous injections into rabbits at weekly intervals were tested; 0·1 cc. of *L. geometricus* antiserum neutralized 1·0 mgm. of homologous extract, 0·4 mgm. of *L. concinnus*, whereas 0·2 cc. did not always protect mice against 0·1 mgm. of *L. indistinctus*. There was no neutralization of Cape cobra (*N. flava*) or puff adder (*Bitis arietans*) venom; hence it is useless to treat spider bite with either of these snake antisera.

Symptoms following bites by these spiders were: cramp-like pain in the chest and abdomen, with abdominal rigidity, sweating and salivation; often cyanosis with nausea, vomiting and dyspnoea. In animals there were sweating, restlessness, staring coat, rapid shallow breathing, paralysis, and convulsions preceding death—*i.e.*, neurotoxic symptoms, like those of Cape cobra venom, though, as stated above, the antivenene of the latter is ineffectual in treatment. The best treatment is incision and application locally of potassium permanganate. Since *L. indistinctus* antiserum completely neutralizes the venoms of all three species, this is the best to keep for emergencies. *H. H. S.*

PLANTILLA (Fidel C.) & MABALAY (Epifanio). *Latrodectus agoyangyang.* **Preliminary Notes on the Entomological, Clinical and Experimental Studies.**—*Monthly Bull. Bureau of Health.* Manila. 1935. June. Vol. 15. No. 6. pp. 187–197. With 1 coloured plate.

Poisoning from spider-bite is not infrequent in the island of Cebu and probably elsewhere in the Philippines. The cause is a Latrodectus, distinct from *L. mactans* (the Black Widow spider) and closely allied to *L. hasselti*. Its local name is Agoyangyang, hence it is here called *L. agoyangyang*. Its entomological characters are described; when full grown the female extends its legs over about 3·5 centimetres. The body is black and red; one very similar, perhaps identical, and also poisonous is brown (instead of black) with red markings.

Symptoms following the bite are: local pain like a needle-prick, not severe, and soon after there is numbness in the legs with pain and

general weakness, followed by fullness and pain in the abdomen which becomes distended and rigid ; respiration is laboured and thirst is great. These symptoms last for 24–48 hours and then subside. Some have headache, vomiting and fever, and in fatal cases cyanosis. In one fatal case, a man of 51 years, bitten on the foot, death occurred in two days.

Experimental work was carried out on chickens, parrots, cats, dogs, guineapigs, white rats, monkeys and frogs. In all there were signs of restlessness and respiratory distress with paresis of limbs, sometimes convulsions ; diarrhoea occurred in the monkey, vomiting and salivation were marked in the dog, the vomitus becoming blood-tinged. The frog suffered from paresis and died in 2 hours, cessation of respiration preceding by some time circulatory failure. Further study of the subject is to be made. *H. H. S.*

DEFICIENCY DISEASES.

LOEWENTHAL (L. J. A.). **An Inquiry into Vitamin A Deficiency among the Population of Teso, Uganda, with Special Reference to School-Children.**—*Ann. Trop. Med. & Parasit.* 1935. Oct. 5. Vol. 29. No. 3. pp. 349–360. With 1 map.

One thousand one hundred and twelve persons including 1,000 school pupils in the Teso district, Uganda, were examined for signs of vitamin A deficiency. Three hundred cases showing xerophthalmia or the characteristic follicular eruption of the skin were classified as suffering from the deficiency. The incidence in children was 30 per cent., in adults 8·7 per cent. In the dry season (December to March) the diet of the native consists of maize meal, casava, ground nuts and beer (made from millet). At other times the diet is improved by additions of sweet potato and green vegetables and it is customary to dry sweet potatoes and store them ; in years when the sweet potato crop is poor, such as 1934, this is not done. The investigation showed that three months of vitamin A deficiency caused visible signs in about half of those under puberty, in a quarter of the adolescents and in only a very small fraction of adults. No signs of sex difference in incidence was noted in spite of the fact that cooked eggs (about two a week) are eaten by the men but not by the women. Economic factors play a big part in the incidence of the disease, which seems to vary inversely with the number of cattle owned in the family. The absence of other deficiency diseases was noteworthy and is ascribed to the prevalent custom of drinking beer and possibly the whey of soured milk. At present the population is only on the verge of serious vitamin A deficiency as shown by the low percentage of adults affected, the low incidence of xerophthalmia in children suffering from phrynoderma and by the absence of cases of keratomalacia. A prolonged drought might produce serious effects. If it can be shown that sun-dried sweet potatoes do not lose their vitamin A, the disease can be prevented by encouraging the native to store sufficient for the dry season. Otherwise the schools offer an easy approach to the treatment of a certain proportion of the child population. *H. N. H. Green.*

CHAN (Mary). **Infantile Beri-Beri in Kwangtung.**—*Chinese Med. Jl.* 1935. July. Vol. 49. No. 7. pp. 676–678. [Summary appears also in *Bulletin of Hygiene.*]

During 1933–34 the author met with 46 cases of infant beriberi at the Fatshan Hospital, Kwangtung Province. More than half the patients showed symptoms in the 3rd or 4th week of life. The common symptoms were vomiting, which might be severe, aphonia which was very striking, oedema (of face and extremities mainly), and absence of knee-jerk in about three-fourths of the cases. All but one were breast-fed ; 27 of the mothers showed signs of beriberi and several of the remainder were ill-nourished. In 27 instances there was a history of one or more previous children having died of a similar condition.

Treatment comprised stopping breast-feeding for the first week and giving cows' milk with addition of orange juice, cod-liver oil and marmite ; with older children (2 months) rice-water made from red rice. Thirty-five who were admitted were given tiki-tiki extract—severe cases 1 cc. hypodermically every 4 hours to 12 doses, then 1 cc.

by mouth, less severe cases 1 cc. three times a day. Five died within 3 days of admission; this appeared to be the critical period, after which improvement took place. Six were not traced. Vomiting was the first symptom to clear up, aphonia the last. *H. H. S.*

FLEISCHER (D.). De beri-beri atrophica op Zuid-Oost-Celebes. [**Atrophic Beriberi in South-East Celebes.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1935. Nov. 12. Vol. 75. No. 23. pp. 1975–1986. With 7 figs on 1 plate. [Summary appears also in *Bulletin of Hygiene.*]

An epidemic of beriberi in South-east Celebes broke out in the years 1933–34 due to failure of the rice crop, the economic depression and the consequent replacement of sago for rice in the diet of the population. By the end of 1934 this epidemic began to subside with the appearance of a good rice crop and probably also with the planting of katjang idjoe. It was noteworthy that the epidemic occurred in the sago palm region and that to the south, where sago is not eaten, there was famine but no beriberi. The number of sufferers from beriberi amounted to 3,000 out of a total population of 116,500, and 1,849 patients were admitted to the hospitals. In its main characters the disease was of the atrophic type. It began with formication; then followed some slight oedema, but pareses of one kind or another were the main feature of the outbreak. There was atrophy of muscle and of fat with consequent emaciation. Reflexes persisted for a considerable time. Nevertheless, the tendo achillis reflex, once lost, sometimes did not return even with recovery. The heart was generally compensated for the resting condition and only slight dyspnoea developed on effort, while arhythmia was exceptional. Dilatation of the heart was manifest in 60 per cent. of the cases and the *cor bovinum* was frequently present. Only one case of acute heart death was recorded. Systolic blood pressure was normal but the diastolic pressure was always low, at times very low; it rose rapidly with treatment. In thirty cases the adrenalin reaction was tested; if the beriberi is progressive this reaction is probably always positive. In this epidemic there died 6 out of the 1,849 hospital patients, but the mortality was usually due to some complication and recovery was recorded in the 1,843 non-fatal cases. This recovery was brought about by rest and the administration of vitamins. Vitamin tablets gave better results than red rice and katjang idjoe. No cases of enterogenic beriberi occurred. Men suffered twice as frequently as women and the disease was much less among children.

W. F. Harvey.

CHOPRA (R. N.) & BHATTACHARYA (S. N.). **Observations on Epidemic Dropsy Cases admitted into the Tropical Diseases Hospital from 1922 to 1933.**—*Indian Med. Gaz.* 1935. Sept. Vol. 70. No. 9. pp. 498–501. With 3 graphs. [13 refs.]

During the period 1922–33 there were 131 admissions for epidemic dropsy at the Carmichael Hospital. The greatest number in any one year was 39 in 1926; in the 1932 epidemic 23. The curve of admissions month by month shows a sharp rise from June to a maximum in August; thereafter a rapid fall till October and slower through the colder months to April. Outbreaks were most prevalent during the rains and immediately after.

As regards age, of the 131 sixteen were in the first decade, and in succeeding decades 39, 42, 22, 8, 3, 0 and 1. The age of the youngest was 2 years [in the Purulia outbreak (see following abstract) there was no patient under 4 years]. It is a disease of rice-eating people. The main symptoms are: *Oedema*, which was seen in 125; it was usually of solid type, especially in the early stages and tenderness and redness of the affected parts were common. *Diarrhoea*, more often noticed in severe epidemic years when more acute cases are admitted to hospital. *Fever* occurred in 94 of the 131; mostly of a low irregularly intermittent type, in others a low remittent. *Cardiac* symptoms with dilated heart, tachycardia, dyspnoea and even orthopnoea as a result. *Nervous* symptoms, except for pain and tenderness in the limbs, were rare. Knee-jerks were variable, not altered in 59, diminished in 2, lost in 17, increased in 39, unequal in 14. *Cutaneous*: flushing, petechial rash and sarcoids [see below]. *Ocular*: retinal engorgement, retinal haemorrhage, cupping of the disc, increased tension.

The death rate in this series was 6·8 per cent. Treatment found most efficacious comprised rest in bed with a rice-free diet, and as regards drugs tincture of *Ephedra vulgaris* with calcium lactate. *H. H. S.*

CHOPRA (R. N.) & CHAUDHURI (R. N.). **A Preliminary Report on an Epidemic Dropsy Outbreak in Purulia.**—*Indian Med. Gaz.* 1935. Sept. Vol. 70. No. 9. pp. 481–485. With 1 fig. [12 refs.]

INDIAN MEDICAL GAZETTE. 1935. Sept. Vol. 70. No. 9. pp. 511–512.—**Epidemic Dropsy.**

Outbreaks of epidemic dropsy have occurred at intervals since 1913, namely in that year, in 1927, 1930, 1932, 1933 and the worst in 1934. In the last it started in August and soon spread to adjacent villages, more than 2,000 persons being attacked among a population of 25,974. Further enquiry among 114 villages revealed some 5,000 cases. Thirty-five per cent. of the boys and staff of the Manbhum Victoria Institution and 113 of 450 members at the Purulia Railway settlement suffered. In 13 villages near Purulia with a combined population of 8,050 there were 825 cases, or 10 per cent. incidence.

Very few of the patients were of the poorer classes, nearly all were of the upper and middle classes. The poor labouring class lived only on freshly-husked rice; servants of this class were affected only when they had meals at their masters' houses. In some cases all of a family were attacked, 8 out of 8, in another 9 out of 11; in 20 families with 121 members 74 were attacked. Although on the same diet, the members affected might show very varying grades of severity. Rice was the staple food, parboiled and mostly husked at home. The better classes would throw away the rice-water, the poorer took it with the rice. Mustard oil was also used.

For better study of the disease a Field Unit was established at Gaurangdih, near Indrabil railway station. The sexes were equally attacked, but no child under 4 years (they consume little rice). Diarrhoea was a common symptom, at times very severe, almost choleraic; palpitation and dyspnoea were present; the oedema appeared first in the legs, over the lower third of the tibiae, rarely involving the thighs and hands, and never the trunk or face. In 14 patients a macular or erythematous rash was observed on the inner aspect of the thighs [see below]. Abortion always occurred when pregnant women were attacked. The most successful treatment was a rice-free diet, rest,

and administration of tincture of ephedra, 20–30 minims with calcium lactate 10 grains, b. or t.d.

In an appendix to this paper is a brief account of an outbreak in an engineering camp of Hindus and Mohammedans at Purulia. Forty-six of 55 Hindus were attacked, but none of 7 Mohammedans. They mixed freely with each other and used a common water supply; in fact the only difference was that the food was supplied by different contractors, and the rice of the Hindus was heavily infected with bacteria of the "vulgatus" group, that of the Mohammedans being free.

H. H. S.

CHOPRA (R. N.); CHAUDHURI (R. N.); PANJA (D.). **Cutaneous Manifestations of Epidemic Dropsy. Part I. A Clinical Study** [CHOPRA & CHAUDHURI].—*Indian Med. Gaz.* 1935. Sept. Vol. 70. No. 9. 493–496. With 4 coloured plates. **Part II. A Histopathological Study** [CHOPRA, CHAUDHURI & PANJA].—*Ibid.* pp. 496–498. With 11 figs. on 2 plates.

A study of the cutaneous manifestations of this disease, first from the clinical and second from the pathological aspect. The authors describe in detail four cases, met with in the last four months of 1934, in whom different types of cutaneous symptoms were observed. In the first there were vascular nodules, 51 in all, some sessile, a few pedunculated, scattered over the trunk and limbs; in the second was a generalized erythema, but no sarcoids; in the third, small red nodules in various parts of the body, mottling of thighs and legs, and 7 sarcoid growths; in the fourth a rash on the legs and increased pigmentation of the face. In their summary the authors state that the pigmentation is a new feature calling for further investigation.

As regards treatment, none is needed for the rash and the pigmentation; they clear up as the patient recovers. The sarcoids bleed readily and though the haemorrhage is checked by pressure it is liable to recur. If small, CO_2 snow stops the oozing and brings about their drying up; if large, they are better removed under novocaine.

In the second paper the histological appearances are described, first of the simple erythema and oedema; next of the sarcoid in an early stage, and then, in order, of the nodular, the fungating or ulcerative types and of the healing sarcoid. For details the original must be consulted.

The first part is illustrated with coloured plates showing well the various skin manifestations; the second with photomicrographs.

H. H. S.

DE (Manindra Nath) & CHATTERJEE (Krishnadhan). **Nodular Eruptions in Epidemic Dropsy.**—*Calcutta Med. Jl.* 1935. Apr. Vol. 29. No. 10. pp. 521–538. With 16 figs. (7 coloured) on 14 plates.

The "nodular eruptions" of epidemic dropsy have been described and figured [see *e.g.*, this *Bulletin*, Vol. 25, p. 437; Vol. 28, pp. 462–3.]

Here are vivid presentations of them on plain and coloured plates, and a description of 9 cases. In the recent epidemic in Bengal the development of superficial cutaneous nodular eruptions has been the dominating feature; nodules on mucous membrane have also been

noted. They do not inconvenience the patient but may bleed uncontrollably. Photomicrographs show the presence of a large number of capillary blood vessles in loose areolar tissue ; there is no inflammation.

A. G. Bagshawe.

[It might be interesting to examine for Bartonella ; there seem to be some points of resemblance between the above and Verruga.—Ed.]

De (M. N.) & Chatterjee (K. D.). **Pathology of Epidemic Dropsy.**—*Indian Med. Gaz.* 1935. Sept. Vol. 70. No. 9. pp. 489–493. With 6 figs. (3 on 1 plate).

In this account of the morbid anatomy and histology of the lesions found in patients dying of epidemic dropsy particular attention is given to the cutaneous lesions. The erythema referred to in the preceding abstract is due to vascular dilatation and may occur elsewhere than in the lower limbs. Ecchymotic patches may be seen and consist not of haemorrhage but of telangiectases. Nodular excrescences are found, developing 3–6 weeks after the first symptoms ; they may be numerous, 100 or so, or solitary, usually about a dozen and do not appear to bear any relation to the severity of the attack. They may be sessile or pedunculated, of a size from a pea to a lemon, usually quite small ; they bleed readily. They arise in the superficial layer of the cutis vera in the skin papillae and contain dilated vascular spaces. They may occur anywhere on the skin, and also on the mucosa of the mouth, tongue, nose.

Other lesions to be noted are dilatation of the heart with thinning of the muscle walls and separation of the fibres by dilated capillaries. A distressing complication occurring in 10–12 per cent. of patients was a glaucoma developing some weeks after the primary manifestations. No abnormality could be recognized in the spinal cord or peripheral nerves, though the cord membranes might show marked vascularity. Fatal cases are not numerous and there is need for further study of the pathology of this condition.

H. H. S.

Chatterjee (Hemendra Nath) & Halder (Monindra Nath). **Haematological Studies in Epidemic Dropsy.**—*Calcutta Med. Jl.* 1935. July. Vol. 30. No. 1. pp. 1–15. With 4 plates (2 coloured). [25 refs.]

The authors carried out these haematological studies on 45 cases of epidemic dropsy during the outbreak of 1934. They determined the total red and white cell counts, the haemoglobin, the differential leucocyte count, the reticulocyte count and the presence of abnormal cells.

The total erythrocyte count was not much reduced ; in a mild case the lowest was 3·8 millions and in a severe case 3·0 ; the leucocyte total is increased in the early stages to 9,000–10,000, later is about or a little above normal, 7,100–7,900. The haemoglobin in a mild case may fall to 11 gm. per 100 cc. (the normal average being 14·5) and in a severe case to 7·5 gm. According to the severity of the disease the Arneth count shows a shift to the left. As regards the differential leucocyte count the lymphocyte percentage is a little raised, the eosinophile considerably, at the expense of the neutrophiles, and the eosinophilia appears to become greater as the clinical state improves. The reticulocytes are not increased as a rule. So-called toxic cells increase with progress of the disease and diminish with convalescence.

"Toxic cells are characterised by vacuolisation of the protoplasm and the appearance of coarse basophil granules in place of the fine neutrophilic ones in the polymorphonuclear cells. The toxic cells are not present in the normal blood; their appearance has been regarded as a sign of toxaemia and their continued and sustained increase indicates a very bad prognosis. The toxic cell index has been expressed by the following formula :—

$$\frac{\text{Toxic polymorphonuclear cells}}{\text{Total polymorphonuclear cells}} = \text{Toxic cell index.}$$

The result is finally expressed in per cent. relation to the total polymorphonuclear cells."

H. H. S.

DE LANGEN (C. D.) & DJOHAN (Bahder). Pellagra in Nederlandsch-Indië. [**Pellagra in the Netherlands Indies.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1935. Apr. 16. Vol. 75. No. 8. pp. 659–662. With 3 figs. on 1 plate. English summary (3 lines).

The case described is typical; the patient a native of Batavia, 35 years of age, emaciated, anaemic, with atrophic glossitis, mental depression, slight oedema of legs and sores on the dorsum of each foot, roughening of the hands, etc. Blood examination showed red corpuscles 2,156,000 per cmm. Hb 35 per cent., C.I. 0·8. The case is recorded because pellagra is said to be very rare in the Netherlands Indies.

H. H. S.

SPIES (Tom D.). **The Treatment of Pellagra.**—*Jl. Amer. Med. Assoc.* 1935. Apr. 20. Vol. 104. No. 16. pp. 1377–1380.

"It is shown in the present study that the severely diseased pellagrin can usually be cured of his disease, provided he receives sufficient amounts of a potent specific therapeutic agent, adequate rest, food and nursing care. In many instances treatment of the complications and coexisting diseases is essential."

The author has shown that notwithstanding all the patients of a first series were treated in hospital with a highly nutritious diet 54 per cent. of 73 died; in the present series of 125 the fatality rate was reduced to 6 per cent. [but it is stated that one-third relapsed and each readmission was treated as a separate case]. He says that the successful treatment is governed by the rigid application of certain general and specific therapeutic measures, which he describes under the heads, general principles, specific therapeutic agents and treatment of special symptoms.

The general principles of treatment include sufficient rest, and bed for those who are severely ill; often large doses of sedatives; a well-balanced diet of 4,000 calories or more a day; supervision of every detail of diet by the physician; food lost through vomiting or diarrhoea to be made up; good nursing.

The specific therapeutic agents are yeast, desiccated hog stomach, wheat germ, liver extract. Of yeast must be given 75–100 gm. of the dry powder daily, unless there is persistent vomiting or diarrhoea when one of the other agents must be substituted. It is tolerated best at intervals of 3–4 hours in iced milk or iced egg nog.

For desiccated hog stomach (ventriculin) the indications are the same as for yeast; it has not the same laxative properties; 200 gm. is taken daily in the same way. Wheat germ is given in amounts

between 250 and 300 gm. daily. Liver extract may be given orally or parenterally. "The oral administration of 75 to 100 gm. each day rapidly cures the great majority of patients with pellagra," but in patients with persistent vomiting, intractable diarrhoea or severe stomatitis it must be injected daily in 3–5 doses of 20 cc. each. Parenteral injection of liver extract and the simultaneous administration of large amounts of specific antipellagrous materials by mouth is the most successful plan.

For the treatment of special symptoms—*viz.*, stomatitis and glossitis, diarrhoea, abdominal pain, involvement of nervous system, anaemia, dermatitis, the paper must be consulted. Stomatitis occurs in 50 per cent. of severe cases, and disappears when the diet is adequate. 60 per cent. have diarrhoea, which may need tincture of opium; when recovery starts diarrhoea lessens. Two-thirds have persistent vomiting, treated with small amounts of iced fluids. Two-thirds have nervous system involvement or peripheral neuritis or both. The mental symptoms nearly always improve with time though the use of the stomach tube to ensure adequate nourishment, and sedatives may be necessary. Anaemia is best treated in the convalescent period and is cured either by an adequate diet or by iron. The dermatitis heals easily and so cannot be used for prognosis.

To prevent return of the disease the author advises a quart of milk and 6 oz. of lean beef as supplements to the diet, with turnips, tomatoes and green peas. The author was treating 8 patients with delirium tremens and no pellagra at the same time. Both conditions follow chronic alcoholism and the neurologic signs and symptoms were clinically indistinguishable; it seems therefore possible "that the nervous system of the patient with delirium tremens may be involved in a manner somewhat similar to that of the pellagrin who has mental symptoms." Three of 8 pellagrins who died had cirrhotic changes in the liver, and the author notes that 95 per cent. of them "imbibed heavily of alcoholic beverages." *A. G. Bagshawe.*

SHARP (N. A. Dyce). **A Note on a Nutritional Disease of Childhood.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1935. Jan. 25. Vol. 28. No. 4. pp. 411–412.

CARMAN (John A.). **"A Nutritional Disease of Childhood."** [Correspondence.]—*Ibid.* Apr. 17. No. 6. pp. 665–666.

STONES (R. Y.). [Correspondence.]—*East African Med. Jl.* 1935. July. Vol. 12. No. 4. pp. 113–114.

These letters concern a disease, or diseases, in small children described by WILLIAMS from the Gold Coast [this *Bulletin*, 1934, Vol. 31, p. 344] and by GILLAN in East Africa [this *Bulletin*, 1935, Vol. 32, p. 71; see also p. 526] and now stated to occur in Uganda.

The chief features seem to be oedema of the extremities, peeling of the skin and irritability; the issue is usually fatal. In East Africa the passage of large pale greasy stools is noted, and depigmentation of the hair. A vitamin deficiency is suggested by some. *A. G. Bagshawe.*

STANNUS (Hugh S.). **"Kwashiorkor."** [Correspondence.]—*Lancet.* 1935. Nov. 23. pp. 1207–1208.

Dr. Stannus discusses the disease of West Africa designated Kwashiorkor [see *Bulletin of Hygiene*, 1936, Vol. 11, p. 311] and recorded by

Dr. Cicely WILLIAMS. He takes in turn the main points held as distinguishing this disease from pellagra, and demonstrates that they are not valid differences but that the clinical picture of Kwashiorkor is that of pellagra as it affects infants. *H. H. S.*

RATTNER (Herbert). **Burning Tongue.**—*Arch. Dermat. & Syph.* 1935. May. Vol. 31. No. 5. pp. 701–702. [Summary appears also in *Bulletin of Hygiene.*]

Burning tongue is a symptom, not infrequently an early symptom, of avitaminoses or diseases associated with diet deficiencies. Among the conditions in which sore or burning tongue is complained of may be mentioned sprue, pellagra, decoqué in Seychelles, A and B avitaminosis in West Africa, "peripheral neuritis" (so-called) in Jamaica. The following account is therefore both interesting and instructive, in that the cause is one which may easily be overlooked and in this case actually was overlooked for several years. The patient had consulted many physicians on account of this symptom, who not finding any definite cause, came to the conclusion that it was psychoneurotic. The presence of two amalgam fillings and on the other side three gold inlays caused discomfort and a metallic taste and a micro-ammeter indicated that a distinct current was generated by the dissimilar metals. It was owing to this metallic taste that the patient had the amalgam fillings replaced by gold and the relief of the burning which had troubled her so long was prompt. The moral is clear; when a patient complains of burning tongue do not omit examination of dentures. *H. H. S.*

REVIEWS AND NOTICES.

SVENSSON (Ruth). **Studies on Human Intestinal Protozoa especially with Regard to their Demonstrability and the Connexion between their Distribution and Hygienic Conditions.**—*Acta Med. Scandinavica.* 1935. Supp. 70. pp. x+115. With 13 figs. on 2 plates & 1 graph. [104 refs.]

This monograph is in many respects an amplification of a paper previously published by the author (this *Bulletin*, 1935, Vol. 32, p. 220). It describes with meticulous detail certain surveys carried out chiefly amongst the general population and mental hospital patients in Sweden, with a view to determining accurately the incidence of intestinal protozoal infections. Three methods of examination were carefully compared as regards the accuracy of the results obtained. These were the examination of formed stools, the examination of liquid stools following the administration of magnesium sulphate and the application of culture methods to liquid stools. Though the examination of formed stools revealed a few infections not discovered by the other methods, it became clear that the combination of the direct examination and culture of the liquid stools gave practically all the infections noted. The actual methods of carrying out the various procedures employed are fully described and discussed and the findings obtained are carefully analysed and compared. The results arrived at can only be appreciated by reading the whole work but one or two of the more important points can be referred to here. From the purely practical point of view it is clear that the single examination of the liquid stool following a saline purge will reveal the majority of the infections and that it is only by repeating examinations and combining these with cultures, proceedings which are hardly practicable in ordinary work, that all the infections will be discovered. It is noted that a rural population gave a higher incidence of infection with all species of intestinal protozoa than did a group examined in Stockholm, while amongst mental hospital patients there was found a higher incidence than both these groups had given. It was also noted that amongst the patients the incidence increased with the length of residence in hospital, the recent arrivals giving figures no higher than those obtained from the normal population. This finding once again indicates the association of high incidence of intestinal protozoal infections with lack of cleanliness and sanitation. As regards the general population the results obtained are very similar to those which have been given for England and Germany. It is of interest to note that a group examined in Helsingfors gave a higher incidence than did the normal population of Sweden. Of the individual species found the three amoebae, *E. coli*, *E. nana* and *E. histolytica*, gave fairly regularly the highest figures. A notable feature was the unusually high percentage of infections with *Dientamoeba fragilis* and *Enteromonas hominis* amongst the mental hospital patients. It was also revealed that infections with *E. coli* and *E. nana* persist longer in an individual than do infections with *E. histolytica*, *Iodamoeba* and *Chilomastix*. Anyone contemplating carrying out similar surveys is advised to read carefully the account of work recorded in this monograph.

C. M. Wenyon.

ACADEMY OF SCIENCES OF THE USSR. Travaux de la Filiale de l'Académie des Sciences de l'URSS au Tadjikistan. Vol. 5. [**Zoology and Parasitology.**]—480 pp. With numerous illustrations. 1935. Leningrad. [In Russian.]

This volume, dedicated to Prof. E. N. Pavlovsky, contains a collection of papers devoted to the parasitic and free-living fauna of Tadjikistan (Middle Asia). Since it is impossible to review all the papers only a brief survey of the contents of those that have a bearing on tropical medicine and parasitology will be given. P. P. PERFILIEV and V. B. POPOV (p. 15) contribute an article on the bionomics of the sandflies (*Phlebotomus papatasii* and *P. sogdianus*) of Kuljab; another paper by P. PERFILIEV deals with "The biology, systematics and distribution of sandflies of the group *major*" (p. 29). The incidence of intestinal protozoa among the native population of Tadjikistan is reviewed by V. G. GNEZDILOV (p. 53). V. P. PETROV (p. 61) writes on the incidence and epidemiology of kala-azar in Tashkent. G. G. SMIRNOV (p. 95) reviews the data on "Haematophagy among parasitic nematodes;" L. F. PARADOXOV (p. 119) describes two cases of echinococcosis of the human orbit. G. J. ZMEEV (p. 125) contributes a paper on the epidemiology of helminthic infections in Tadjikistan. V. L. JAKIMOFF [= W. L. YAKIMOFF], V. S. BELAVIN and S. I. NIKOLSKY (p. 151) discuss the question of cattle anaplasmosis in the Soviet Union. They recognize two species, *Anaplasma marginale* and *A. rossicum* and compare the symptoms with those in the North African cases. A paper by I. G. GALUZO, I. A. TSHETAEV and V. M. BESPALOV (p. 167) deals with the piroplasms (*Piroplasma bigeminum*, *Françaiella colchica* and *Theileria annulata*) of the cattle in the Valley of Gissar. In another paper I. G. GALUZO (p. 187) incriminates the tick, *Hyalomma detritum rubrum*, in the transmission of cattle theileriosis. I. G. GALUZO and V. M. BESPALOV (p. 199) recommend the transfer of cattle to mountain pastures in summer as a prophylactic measure against piroplasmosis.

M. V. POSPELOVA-STROM (p. 205) gives a systematic account of ticks of the genus *Haemaphysalis* (with a German summary).

The remaining papers are devoted to the free-living fauna of Tadjikistan.

C. A. Hoare.

ALL-UNION INSTITUTE OF EXPERIMENTAL MEDICINE (VIEM). **Parasites, transmetteurs, animaux venimeux.** [Parasites, Vectors and Poisonous Animals.] Recueil des travaux dédié au 25-me anniversaire scientifique du Professeur Eugène Pavlovsky (1909–1934). pp. viii+452. With numerous illustrations. 1935. Moscow. [Roubles 17·50.]

This book is dedicated to Prof. E. Pavlovsky, of the Military Medical Academy in Leningrad, on the occasion of the twenty-fifth anniversary of his scientific career devoted to various branches of parasitology, the advancement of which in Russia is largely due to the wide erudition and untiring energy of Prof. Pavlovsky.

The jubilee volume comprises a series of papers on parasites, vectors and poisonous animals, contributed by Prof. Pavlovsky's admirers, collaborators and pupils, both in Russia and in other countries. The papers appearing in Russian are all provided with summaries in some foreign language, while those written by foreign authors are in their native language.

Since in a short review it is impossible to do justice to the wide scope of subjects dealt with in this book the following titles of some of the papers bearing on tropical medicine and parasitology are given for bibliographical purposes :—

BRUMPT, E. "Etude historique concernant l'étiologie de la fièvre récurrente sporadique de l'Asie." (p. 41).

ALIMOV, A. "Fièvre récurrente de Perse." (p. 54).

SERGENT, Edm. et ET., et PARROT, L. "Insectes et maladies en Afrique du Nord." (p. 68).

KLIMENTOWA, A. A. et PERFILIEW, P. P. "Punaises, puces et tiques comme transporteurs du virus du typhus exanthématique dans les conditions expérimentales." (p. 71).

BYTSCHKOW, W. "Du rôle joué par les puces dans la conservation et la propagation du virus de la peste." (p. 89).

EPSTEIN, H., SILVERS, I., and EXEMPLARSKAJA, E. "Rat fleas as Carriers of Experimental Pneumococcus Infection." (p. 129).

EPSTEIN, H., SILVERS, I., and EXEMPLARSKAJA, E. "Bed-bugs as Carriers of Experimental Pneumococcus Infection." (p. 138).

OLSUFIEV, N. und LELEP, P. "Ueber die Bedeutung der Bremsen bei der Verbreitung des Milzbrandes (Anthrax)." (p. 145).

PARROT, L. "Les éléments de diagnose spécifique des Diptères du genre *Phlebotomus* (Psychodidae)." (p. 198).

PETRISTCHEVA, P. A. "Faune, biologie et écologie des Phlébotomes de la Turcomanie." (p. 202).

NATVIG, L. R. "*Hypoderma lineatum* als fakultativer Parasit eines norvegischen Mädchens." (p. 272).

FAUST, E. C. "Host-Tissue Reaction in Schistosomiasis Mansoni." (p. 287).

WARD, H. "The Longevity of the *Diphyllobothrium latum*." (p. 288).

MOSCHKOVSKY, S. D. "Beobachtungen an der Wuchereriosis in Arabien." (p. 295).

SMIRNOV, G. G. "Nutrition of the Ascaris Larvae in the Process of Migration." (p. 298).

SONDAK, V. "Resistance of the Eggs of the Broad Tapeworm and *Enterobius vermicularis* to Chemicals." (p. 307).

SONDAK, V. "Cockroaches as Carriers and Hosts of Parasitic Worms in Leningrad and Suburbs." (p. 316).

TALYSIN, T. "Contribution to the Morphological Characteristics of the Strobila of *Diphyllobothrium minus* Chol." (p. 328).

STROM, J. "Helminthiasis among the Northern Nations." (p. 334).

STROM, J. and SONDAK, V. "Some new and little-known Trematode Worms belonging to the Families of the Plagiorchidae and Dicrocoeliidae." (p. 348).

HOARE, C. A. "The Development of Trypanosomes in Tse-Tse Flies in Relation to the Peritrophic Membrane." (p. 367).

DOGEL, V. und GNESDILOFF, W. "Zur Frage über die Nährung und Nahrungspeichetung bei *Balantidium coli*." (p. 377).

PIRUMOW, C. N. "Die Wandlungen der Malariaparasitenfauna in Sow. Armenien." (p. 389).

EPSTEIN, H. "Contribution à l'étude des hémoparasites de *Petromyzon marinus*." (p. 398).

PHISALIX, M. "Les venins dans la thérapeutique moderne." (p. 409).

PAVLOVSKY, E. N. und DUNAJEWA, Z. W. "Grundlegende Richtungen der Untersuchung der Helminthentoxine und Angaben über die Wirkung des Extraktes von *Diphyllobothrium latum* auf das isolierte Katzenherz." (p. 416).

PAVLOVSKY, E., STEIN A., and OLSUFIEV, N. "Experimental Investigation of the Action of the Saliva of Gadflies on the Skin." (p. 426).

C. A. Hoare.

REUTER (Johannes). **Oriënteerend onderzoek naar de oorzaak van het gedrag van** *Anopheles maculipennis* **Meigen bij de voedselkeuze.** [Study of the Behaviour of *Anopheles maculipennis* as regards Choice of a Food Supply.] [Thesis for Doctorate of Science at Leiden University.]—118 pp. With 6 figs. [98 refs.] Discussion of the Results in English. 1936. Den Haag: N. V. Electrische Drukkerij "Luctor et Emergo."

It is generally held that the races of *Anopheles maculipennis* differ from one another in their avidity for human blood. The author has endeavoured to subject this view to experimental tests.

A considerable part of the experimental work was carried out with an "artificial arm," which was a glass tube through which warm water was circulated. It was generally covered with filter paper and introduced into a cage of mosquitoes, observations being made on the insects' attempts to bite it. Working mainly with *A. maculipennis* var. *atroparvus*, the author showed that the most important stimulus is provided by the temperature of the artificial arm, which is not attractive unless it is at 28°C. or a higher figure [the temperature of the cage not being stated]. Provided the temperature is at 28° or above, the wet filter paper was more attractive than dry [though we must demur to the statement that they were of the same temperature, for evidently the wet filter paper would be the colder unless the air was saturated at the temperature of the artificial arm]. The author found that paper wet with sweat or cotton rubbed on the surface of a pig, was not more attractive than wet paper; if the paper were wetted with blood it became more attractive than paper and water.

The author then evolved a large elaborate piece of apparatus which consisted of a cage of mosquitoes in the centre, communicating with a large box on either side. He performed a number of experiments such as putting a man to sleep in one box and a pig in the other and counting the mosquitoes, both those full of blood and others, in the morning. This experiment appeared to show that the choice of the mosquito is determined by such things as temperature and humidity, rather than by the species of host. This view is interesting, but it should have been subjected to precise proof or disproof by taking adequate measurements of the climatic factors concerned. So far as the reader of the English discussion can discover no adequate steps were taken to measure these factors. *P. A. Buxton.*

THE BRITISH FILM INSTITUTE. **Catalogue of British Medical Films of Technical Interest to Medical Practitioners and Students.**—48 pp. London: 4 Great Russell Street, W.C.1. [1s.] [Review appears also in *Bulletin of Hygiene*.]

This Catalogue, which has been compiled by the Medical Panel of the British Film Institute, supplies a need which has long existed and should do much to encourage the use of cinematography for educational purposes. The International Institute of Educational Cinematography, with the assistance of the Health Section of the League of Nations, is preparing an encyclopaedia of medical films produced both at home and abroad and this Catalogue constitutes the first step taken in this country towards international collaboration on the subject.

Information has been collected respecting films in existence at medical schools and universities, and many owned by other bodies and

individuals have been examined and added to the list. It is realized, however, that a number have still to be included and it is hoped that these will be brought to the notice of the Medical Panel of the British Film Institute as soon as possible. It is intended, with the help of the Colonial Office, to supplement the Catalogue from time to time by incorporating films produced in the Dominions and Dependencies.

The "Catalogue of British Medical Films" is not a guide as to the quality or to the value for teaching purposes of each film included, but it is a well-classified list of British films, and information is given in each case with regard to title, date, author, width, silent or sound, length, suitability and the name and address of the owner. It is well arranged, has a very good index of both authors and subjects and should prove most useful to all persons anxious to develop in this country a method of education which deserves far more attention than it has hitherto received.

[Some 200 films are catalogued, the list being confined to British films—a limitation that explains the omission of many medical films of foreign authorship to be seen in Great Britain, such as the familiar films of Malaria and Hookworm Disease issued by the Rockefeller Foundation. The Kodak Co. have also published a catalogue of their Medical Film Library in which titles of 150 films are given, some of them of tropical interest.] *G. S. Parkinson.*

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